THE RAILWAY REVIEW

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SIGNALING IN RAILWAY TUNNELS.—In a recent issue of the French Revue Industrielle some of the methods employed in different countries for signaling in railway tunnels are described. According to our contemporary, the precautions of the French Northern Railway are based on the block system. The western and southern lines use electric bells between the two extremities. In the St. Gothard tunnel lights are fixed on the wall at a kilometer apart and on alternate sides. In the Weckawhen tunnel (United States) a series of incandescent lamps are fixed along the wall—100 meters apart—on a hight about level with the engine driver's eye. When the road is clear all the lamps are alight; when a train enters the tunnel it extinguishes automatically as it advances the lamps it has passed, for a length of 400 meters; after which the lamps relight themselves automatically. The driver can thus be certain that the road is clear for at least 400 meters.

MOUNTAIN MAHOGANY.—One of the most remarkable products of Nevada is a species of wood known as mountain mahogany, which, when dry, is as hard as boxwood, very fine grained, of a rich red color, and in weight very heavy. It has been used for boxes for shafting, and in some instances for slides and dies in quartz batteries. It burns with a blaze as long lasting as ordinary wood, and it is then found almost unchanged in form converted to a charcoal that lasts about twice as long as ordinary wood, giving also an intense heat, greater than coal gives. Another notable species of wood, having extraordinary durability, is said to be the quebarcho wood of Argentina. Posts that have been in the ground 150 years, in soil alternately sodden by tropical rains or parched by intense heat, are found to be in sound condition. The wood is also described as free from attacks of insects, does not decay, and is not compressible, and weighs nearly 80 lbs. per cubic foot.

SCALE IN BOILERS.—A very novel method of getting rid of scale in a boiler is credited by a Boston paper to an engineer in that city. The scale came from the use of well water. The feed pipe enters the front of the boiler just about the water line, and has slots cut in it about an eighth of an inch wide, instead of the ordinary spraying method of distributing the water, and surrounding the feed pipes in the larger pipe, about 6 in. in diameter and cut away at the top; the feed water enters the boiler and discharges through the slot in the feed, despositing all the foreign matter in the water into this catch pipe instead of into the boiler—the success of the plan depending upon having a high temperature of feed at about the boiling point, when the solids held in suspension of or solution in water will be deposited.

EFFICIENCY OF WORM GEARING.—A statement that worm gearing if used for power transmission in electrical works, should be employed only in conjunction with low speed motors, has brought out a statement from E. Kolben, of the Oerlikon Engineering Works in Germany, who, in a contribution to a German publication, says that high speed motors should be adopted in such cases if the best results are to be obtained. He points out, says Engineering Mechanics, that a great prejudice against worm gearing has hitherto existed, on account of its having been regarded in the old text and hand-books as an inefficient means of transmission. He believes, moreover, that much depends upon the construction of the gearing, and refers to tests recently carried out by Professor Stodola, of the Zurich Polytechnic, with the ordinary double thread worm gear of the Oerlikon Engineering Works. The worm was 3.15 in. in diameter, had a multiple ring bearing and engaged with a worm wheel having 28 teeth, the wheel being of bronze, 14.7 in. in diameter. The whole of this gear was placed in oil in a cast iron box. The gear was coupled to a 20 horse power electric motor, and the brake was applied on the worm wheel shaft. At 1,500 revolutions a useful performance of 21 horse power was given on the brake, the efficiency amounting to 87 per cent. Mr. Kolben is of the opinion that the efficiency with the motor fully loaded will increase even beyond 90 per cent, if the speed is high, the worm made of tool steel polished, the worm teeth of bronze, and the friction of the whole mechanism on the starting of motors at full load, is reduced by having the pressure taken up by starting discs arranged on both ends of the worm.

JAPANESE RAILWAYS.—Railway construction in Japan which was temporarily interrupted during the late war, is again becoming active. A sum of $22,000,000 has been voted for the construction of a double line, 376 miles long, between Tokio and Kobe, passing through the principal commercial and industrial centers of Japan, viz., Yokohama, Kioto and Osaka. Numerous other lines have been projected in different parts of the empire. Official figures state that in March, 1895, there were in Japan 29 railway companies, with 2,193 miles of line, of which, however, only 1,549 miles have been opened for traffic. In addition there were state railways, aggregating 580 miles of line, completed, and 398 miles in course of construction. The total capitalization of the 29 corporations mentioned is about $80,000,000, and that of the government lines $70,000,000.

UNEXPLAINED CHANGES IN IRON AND STEEL.—The effects of hardening, tempering and annealing, familiar to the world, doubtless, for several thousand years, is stated by Sir Benj. Baker to have only recently been partially lifted out of the class "mysterious" by researches of a like nature, to the preceding. There are many other "mysteries" of an analogous kind waiting to be cleared up. We should like to know, for example, what is going on month after month in hardened steel armor piercing projectile which frequently leads finally to a violent disruptive explosion of the mass, and also what causes a sword to loose temper by lapse of time, while the edge becomes sharper. Why, again, should the tough and flawless bar iron suspension links, which have carried the Hammersmith bridge successfully for over 60 years, snap in two by the dozen during simple transport to Edinburg, although in every case the halves of the broken links on being thrown down 300 ft. from the top of the Fourth bridge on to the rocks below bent like a corkscrew without fracture. Practical engineers have been aware for 40 years past from Fairburn's experiments that at temperatures of 60 degrees and 320 degrees the strength of wrought iron was practically constant, while at 30 degrees, the strength was slightly increased; but until Professor Dewar's recent researches they could never have conceived that when immersed in liquid air at a temperature of 320 degrees the strength of iron wire would be raised from 34 tons to 62 tons per square inch. The chemical constituents of iron and steel do not change, but the molecular arrangement and inter-crystalline cohesion must change, and it is to mechanical investigation and laboratory work rather than to practical engineering that we must look for an elucidation of the process.

CAST STEEL TEST.—Some unusually strong and tough steel castings are described in a recent article by G. C. Henning. These castings were made for anchor plates for a suspension bridge, and their properties were determined by testing pieces cut from the upper parts of each casting, where the metal was more liable to contain scoria, loose particles and gases than elsewhere. All the test pieces had the ductility and fine grain characteristics of rolled steel. The bending test required by the specifications necessitated the strips to be bent without fracture to a right angle, but as a matter of fact pieces one quarter to one-half an inch thick were bent double under a press without showing any defect on the outside or the usual transverse crack on the inside. It should be stated that all of the castings were annealed before the test pieces were cut from them. A large number of bending tests were made with equally good results, which shows that the steel was of remarkable uniformity. A large part of the success attained at the works where these castings were made is believed to be due to the method of annealing in use, by which the initial strain and incipient cracks are wholly avoided. Failure in steel castings, according to Mr. Henning, is often due to the shrinkage of the castings in cooling, which shrinkage is resisted by the sand in the mold, so that unequal strains are set up. To avoid this the practice has been adopted of removing the sand from the interior of the flask as soon as the casting has set and before shrinkage has taken place. This is done by water jets. The flask is pierced with holes, and as soon as the casting is formed hose nozzles are introduced at these holes and the sand washed out. The flask is then knocked apart and the casting is taken at once to the annealing oven while it is still at or but little below a red heat. Mr. Henning further states that it is evident when metal of such strength, toughness and uniformity can be secured in a casting, the designer of machinery who is aware of the fact can greatly improve his constructions on the one hand by substituting steel castings for cast iron pieces, and can reduce the cost, on the other hand, by using cast steel instead of forged steel for many parts. The test pieces had a strength of from 63,000 to 75,000 lbs. per square inch, and an elastic limit of from 27,500 to 38,500 lbs. per square inch.

WOOD PRESERVING IN SWITZERLAND.—A simple, effective, and cheap way of preserving wood from decay is said to be practiced in Switzerland in the preparation of posts for the telegraph service. A square tank, having a capacity of some 200 gallons, is supported at a hight of 20 ft. or 25 ft. above the ground by means of a light skeleton tower built of wood. A pipe drops from the bottom of the tank to within 30 in. of the ground, where it is connected with a cluster of flexible branches, each ending with a cap having an orifice in the center. Each cap is clamped on to the larger end of a pole in such a manner that no liquid can escape from the pipe except by passing into the wood. The poles are arranged parallel with one another, sloping downward, and troughs run under both ends to catch drippings. When all is ready, a solution of sulphate of copper, which has been prepared in the tank, is allowed to descend the pipe. The pressure produced by the fall is sufficient to drive the solution, gradually, of course, right through the poles from end to end. When the operation is ended, and the posts dried, the whole of the fiber of the wood remains permeated with the preserving chemical.

WIRE FLYWHEEL.—Among the most recent and novel applications of wire, attention is drawn to the wire flywheel lately erected at the Mannesmann Tube Company's Works, Germany, and, especially notable, in view of the well known fact that heavy flywheels, driven at high velocities, present such dangers of breaking assunder from the great centrifugal force developed. The wheel at the factory mentioned is described as a cast iron hub or boss, to which are attached two steel plate discs or cheeks, about 20 ft. in diameter. The peripheral space tween the discs is filled in with some 70 tons of steel wire, completely wound around the hub, the tensile resistance thus obtained being found to be far superior to that of any casting. This huge flywheel is driven at a speed of about 240 revolutions per minute, or a peripheral velocity of 2.8 miles per minute or approximately 230 ft. per second. which is said to be nearly three times the average speed of any express train in the world. For such a constructed flywheel the length of wire is estimated at about 250 miles. The use of paper is also regarded with favor for large flywheels, the tensile strength of paper being enormous, and it is quite possible that some of the new big wheels will be built up with a paper rim.

STATION NAME BOARDS.—On account of the many complaints received by the board of trade as to the inconvenience caused to the traveling public by the ineffective manner in which the station names are indicated at railway stations, a circular was sent out to the various railway companies of the United Kingdom asking them to state what steps they proposed to take in order to deal effectively with the subject. The replies to this circular are contained in a blue book just issued. Among the various companies whose answers are given, the Great Northern Railway Company states that it has decided, with a view to keeping the names of the stations distinct from advertisements, to show the names on angular boards projecting from the station walls, and also on platform lamps, and, when practicable, waiting room windows. The Great Western Company reports that it has taken steps to provide distinctive name plates at all new stations, and to re-arrange those at existing stations (when these stations are renovated), so as to leave a space of 12 in. between the name board and advertisements. A standard pattern of name board has been adopted, and the boards are fixed in prominent positions. The names are also shown on lamps and seats. The Metropolitan Company reports that the names are shown at its stations on boards and platform lamps and seats, and that it has given notice that all advertisements must be removed 18 in. clear of the name boards. They have also provided additional boards, which, to prevent confusion with advertisements, bear the word "station." The Metropolitan District Railway, after describing the way in which the names are displayed at its stations, add that it has also decided to adopt an apparatus for automatically indicating in each compartment the name of the station the train is approaching. The Caledonian Company proposes to make arrangements to prevent advertisements from being placed in close proximity to the name boards. The majority of the other companies express the opinion that their present arrangements in respect to station names are satisfactory; but a number of them add that they will be glad to consider any recommendation which may be made to them on the subject.

AMERICAN LOCOMOTIVES FOR FOREIGN RAILWAYS.—The order for 40 locomotives given by the Russian government to the Baldwin Locomotive Works, leads La Genie Civile to say: "Already in the matter of furnishing railroad material American constructors had taken possession of the South American market and were carrying on a formidable competition against the English in their own colonies, especially in New Zealand and Australia, but it was hardly expected that they should be seen obtaining a foothold in Europe." Why not, pray? Are not American locomotives the most beautiful in design, the most nearly perfect in construction, the most reliable in function, the swiftest in motion, and the best in all essentials of all locomotives on earth? Why should European railroad builders not have as good taste and judgment in selecting locomotives as the railroad builders of Australia and South America? Go to! Europe, as an artistic country, should buy only American locomotives, or else compel European builders to build locomotives strictly on the American models.—Iron Industry Gazette.

A RUSTLESS COATING—By forming on the surface of iron and steel a double carbide of hydrogen and iron, which is extremely hard and adhesive, protection of the metal from rusting is said to be insured. This is a French process, and the treatment is effected in a pair of gas retorts, set side by side, and raised to a temperature of from 600 to 700 degrees, cent. The articles in this case are placed in a retort for about 20 minutes, when a current of hydrogen is turned into to the retort and kept on for 45 minutes, a small quantity of naphtha being now introduced, the supply of which is kept on for 10 minutes. After this the naphtha is shut off, a current of hydrogen is turned on for 15 minutes longer, when the process is finished. All that remains is to cool the retorts down to 400 degrees cent, and as soon as this temperature is reached, the retort lids may be taken off and the product removed. The coating thus produced has a bluish color, and is stated to be so adherent to the metal that a treated bar can be bent through an angle of 45 degrees without disturbing it.

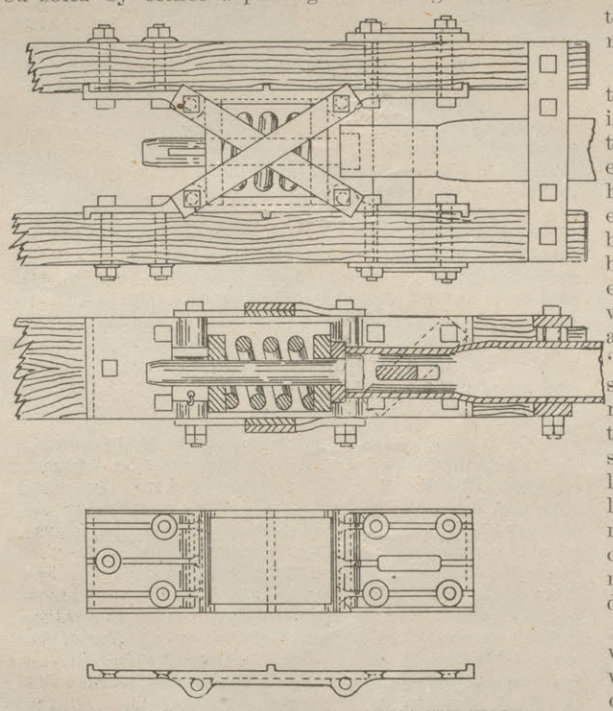
A SMALL TREE.—The midget of the whole tree family is the Greenland birch, says the Lumber Trade Journal. It is a perfect tree in every sense of that term, and lives its allotted number of years (from 75 to 130 years) just as other species of the great birch family do, although its hight, under the most favorable conditions, seldom exceeds ten inches. Whole bluffs of the east and southeast coast of Greenland are covered with "thickets" of this diminutive species of woody plant, and in many places, where the soil is uncommonly poor, and from eight to ten months a year, a "forest" of these trees will flourish for half a century without growing to a hight exceeding four inches.

PAYING FOR BRAINS.—It is well observed by Machinery that those who determine the rate which shall be paid to labor in the great majority of the shops do not seem to realize that brains are just as desirable in the management of the shop or drawing room as in the management of the finances of the company. The treasurer who can guard his finances so as to save a half per cent here, or a quarter there, in some shrewd business deal is looked up to as a man to be retained at any cost and no salary within reason is too high for him to receive. In the shop it is different. The right kind of a foreman is continually saving money for the firm and in many cases actually saves many times the amount which the financial man boasts of, yet he only receives "shop pay" which seldom exceeds four dollars a day for a shop foreman and which is considered good wages It is the same in the drawing room. Mistakes here are costly, and the brainy man in charge of this department can save more in proportion than almost any other officer or employe; yet how seldom is it recognized in a substantial manner, and we find draftsmen about as poorly paid in proportion to their work as the men in the shop. But, some will say, they cannot afford to pay a large salary; and if they cannot they should not expect a high grade of work or managing ability. The man who can save a thousand dollars a year is certainly worth more than the one who can save only a hundred, yet this is too seldom given sufficient consideration in determining the salary due. While the demand and supply of labor largely regulates its rate of remuneration, none can deny the justice of giving each a fair share of the product of his or her labor and

if a man can save you money (which is equivalent to adding to your profits) he certainly deserves a fair share of savings.

THE HOEY DRAWBAR ATTACHMENT.

The accompanying illustrations are reproduced from drawings of a draw-bar attachment patented by Mr. M. J. Hoey, master car-builder of the Columbus, Hocking Valley & Toledo Railway, which has some very good points. The attachment is intended for use with a tail bolt and is designed to overcome the danger of the bar being pulled out in case the pin breaks. This is a fatal defect in most designs where the tail bolt is used. The buffer spring is carried between two followers of the usual form and these followers are held in place by two malleable iron pockets each weighing 38 pounds and secured to one of the draft sills by seven bolts. The pockets are braced and held in their proper relative position by wrought iron straps each ½ x 2x17 in., placed diagonally as shown. The draw-bar is secured to the followers by the usual form of tail bolt and the safety device consists of a wrought iron strap or key 1x3x21 in., which passes through a slot in the bar, which is cast for receiving it, and is carried by the draft timbers in a corresponding slot through them and the pockets. The outside end of each slot in the timbers is reinforced by a malleable iron plate washer, and the key is held in place by a wrought iron strap which covers each end and is secured by the bolts, which hold the pockets in place. The slots are so placed that when the spring is compressed solid by either a pulling or buffing strain the



THE HOEY DRAW-BAR ATTACHMENT.

work is transmitted through the key to the draft timbers direct, and the draft rigging is relieved from all heavy blows. The amount of work thrown upon the draft gear can be regulated by changing the length of the slot.

It is claimed for this attachment that it is much cheaper than those having the strap pocket and that it is just as strong and more safe from the liability of the bar pulling out. The Dayton Malleable Iron Co., of Dayton, Ohio, has the exclusive right to manufacture the attachment, and it is being put on a large number of cars.

THE GENESIS AND PROGRESS OF A GREAT RAILROAD SYSTEM.

The Boston & Maine.

Practically everything is the result of evolution, and nothing is more so than the great transportation lines of the country. They began when there was but a fringe of settlements on the shores of the Atlantic, and have ever since been growing in magnitude, importance and influence. The coast of eastern New England was one of the earliest and most thickly settled regions of this land, and there are now more people there to-day to the square mile, than in any other part of our country. In this region up to well along in the eighteenth century there were no regular land transportation lines, the communication between places being maintained by private conveyance or horseback over country roads, or by sea; mostly the latter.

In 1770 there was organized a new stage chaise line to operate between Salem and Boston, and in 1771 a connecting post chaise, and another curricle, or sort of two wheeled chaise drawn by two horses abreast, were put on to run regularly between Boston and Portland, Me. These proved so successful that in 1818 there was organized the Eastern Stage Co., which was chartered with 425 shares at $100 each. Its stages left Portsmouth, N. H., for Boston at 9 o'clock every morning. The passengers dined at Topsfield, Mass., about 30 miles from the starting point, and then continued their journey through Damersport and Salem to Boston, arriving in the evening after a ride of 65 or 70 miles. The directors of this company were good financiers, for in 1825 they had established a sinking fund and carried $1,000 to that account. In December of that year they declared a semi-annual dividend of 4 per cent and created 75 new shares of stock, making a total of 500 shares, allowed by their charter, and also incidentally keeping their dividends down after the fashion of the railroad financiers of to-day. Notwithstanding this, their next dividend was a semi-annual of 6 per cent, and that of 1826 entire, 11 per cent. In 1828 the shares of the Eastern Company were at $50 premium and a semi-annual dividend of 8 per cent on $150 was declared. In 1830 the company was incorporated in Massachusetts with $100,000 capital. In 1832 it had grown into a large concern covering with its stages much of the ground now occupied by the Boston & Maine. It ran regular lines of coaches from Concord, N. H., to Portsmouth; from Dover by two routes to Newburyport, Salem and Boston; from Salem to Haverhill and Lowell; from Gloucester to Ipswich and from Lowell by two routes to Newburyport. In 1832 it was free from debt and owned 500 horses and their equipments. In 1834 its stock sold for $200 a share, par value being $100. In 1835 the company was paying from $8,000 to $9,000 annually in turnpike tolls, and owned large amounts of turnpike, bridge, bank and hotel stock. Henry Clay made a trip over its lines, and Daniel Webster rode at speed, post and special, over the route from Boston to Portland to sign the Ashburton treaty, at 16 good English miles an hour. This was in staging as remarkable time as some of the New York Central's special runs of to-day are in railroading.

There were at and before this time two routes for the stages between Boston and Portland, one following the so-called "upper route," very close to that of the original Boston & Maine Railroad (now its western division), and the other, or "lower route," as we have seen, over the line occupied later by the Eastern Railroad, and when in later days railroads were built over the stage routes, as they naturally would be in order to follow the current of travel as already established, the early cars of the Boston & Maine were lettered "Boston & Portland via upper route" and those of the Eastern Railroad were lettered "Boston & Portland via lower route." When the stage lines had developed the land channels of communication and been so prosperous it was certain that when their day was over and the steam horse succeeded the flesh horse, the lines of rails would follow closely the established routes, and so we find in 1836 the various roads now comprising the Boston & Maine system creeping into existence along these already developed routes, and a little later many of the former stage drivers acting as conductors on its trains.

One of the earliest of the Massachusetts railways was the Salem & Lowell, built in the days when the shipping interests and commercial activity of Salem were greater than that of Boston. In that year the Boston & Lowell Company built from Boston 15 miles out to Wilmington, Jct., on the Salem & Lowell, and sent its passengers to Lowell on the Salem & Lowell trains. The Boston & Maine Company was then organized and did its first construction from Wilmington, Jct., to Andover, Mass., a distance of three miles, bringing its passengers out of Boston by the Lowell road to the junction and thence over three miles of its own road to Andover. In the meantime it built slowly to the eastward, but continued to reach Boston in this way until 1850, when it built its own line into that city over a route 18 miles long. From Andover in 1836 this company continued to build east having seven miles of its own at the end of that year and 17 miles at the end of 1837.

In 1838 the Eastern Railroad Co., grown, no doubt, out of the Eastern Stage Co., began to build its road over the "lower route," and at the end of 1839 had 28½ miles of track built at a cost of $1,306 a mile, while the first 25 miles of the Boston & Lowell cost, three years earlier, $1,608 a mile. In the next decade, that of 1840-50, we find the Boston & Lowell adding 22.07 miles, the Boston & Maine 66.50 miles, and the Eastern of Massachusetts 30.43 miles, and the Eastern of New Hampshire, a separate corporation with the same officers, 16.08 miles. This completed the Eastern Railroad from the northern boundary of Massachusetts at Salisbury, to Portsmouth, N. H. During this period the Portland, Saco & Portsmouth Railroad Co., a new company, was organized and built 50.76 miles from Portland to Portsmouth, New Hamrshire, via North Bick, Meaine, to meet the Boston & Maine at the latter place, and the Eastern at Portsmouth. The length of this road, all built between 1840 and 1850, was 50.76 miles.

Following the progress of the construction of these lines during the next decade we find that between 1850 and 1860 the Boston & Lowell added 16.80 miles, and the Eastern of Massachusetts 43.87 miles, which latter must have been all branch lines. It is well known in New England that the Eastern Railroad was swamped by non-paying branches, and it evidently began to go down financially in 1855, for in that year its capital stock was $2,853,400, while it had $2,759,386 of debt, and it paid no dividend, giving as its reason, too much competition from parallel lines, meaning the Boston & Maine. This was the first known complaint of this nature. The year before it had paid 8 per cent. But the Boston & Maine had since built through to North Berwick Sunction, Me., 74 miles from Boston. The Portland, Saco & Portsmouth Railroad was then operated jointly from North Berwick, to Portland by these two companies, the P. S. & P. getting 10 per cent of the earnings for trackage and the B. & M. and the Eastern dividing what was left pro rata on their respective business, at that time the present general passenger agent of the Boston & Maine, Mr. D. J. Flanders, being a telegraph operator at North Berwick Junction.

From this period began the death struggle between these two corporations, of which we shall give some account later on. From 1860 to 1869, two of these three roads, whose history is so much intervolved and which covered so much the same territory and eventually become one road, earned good dividends, the Boston & Maine, from 1862 to 1865, paying 8 per cent, and from 1865 to 1869 10 per cent. The Boston & Lowell paid, from 1865 to 1869, 8 per cent. During 1863 the net earnings of these three roads were: Boston & Lowell, $167,051; Boston & Maine, $482,657; Eastern, $394,594. Then between 1870 and 1879 they continued to build, the Boston & Lowell adding 7.93 miles, the Boston & Maine 43 miles, which must have been all in branches, while the Eastern, notwithstanding its bad financial condition, added 11.59 miles.

In 1880 we find the number of people employed by these three companies to be: Boston & Lowell, 1,107; Boston & Maine, 1,526; Eastern of Massachusetts, 2,080; or a total of 4,713 men. At this time the main lines of these three roads were: Boston to Lowell, 26 miles; Boston to North Berwick, 78 miles; Boston to Portsmouth, 57 miles. We have spoken of the fight for survival between the Boston & Maine and the Eastern Railroads, and it grew out of their common use of the P. S. & P. road as means of getting to Portland. The Eastern trains came onto this road at Portsmouth and the Boston & Maine at North Berwick, 17 miles nearer Portland.

The strongest kind of rivalry here began between these two companies which lasted until the absorption of the eastern by its stronger competitor. At this stage the Eastern Company conceived the idea of leasing the the Portland, Saco & Portsmouth, and thus shut the Boston & Maine out of Portland. The two companies operated the Portland, Saco & Portsmouth under a 20 year joint agreement which could be terminated on six months notice, and the notice was duly given by the Eastern and expired. Up to this time it had been customary for a P., S. & P. engine to take the Boston trains over the Eastern road at Portsmouth, and then to stop at North Berwick Junction and attach the Boston & Maine cars to the same train, and then to haul them as one train into Portland. When the Eastern got possession of the P., S. & P. it at once gave notice to the B. & M. that it would not after that date haul its cars from North Berwick into Portland, neither would it stop its trains at North Berwick to take on B. & M. passengers. The next morning the Boston & Maine brought 150 passengers for Portland to North Berwick before the eastern train reached there. Their train then came along at high speed and ran by North Berwick without stopping. The Boston & Maine Maine people at once got out an injunction compelling the Eastern folks to stop their trains at North Berwick, but this of course compelled the B. & M. passengers to change cars there, while the passengers by the other road enjoyed through coaches and the situation could not be endured. So the B. & M. at once began to build through to Portland and completed it in such haste that they spent $4,000,000 in building a distance of 37 miles, including the Portland terminal just alongside the Eastern's at a cost of $108,054 per mile. Just why it should have cost so much the writer is unable to find out. The new line led through the center of Biddeford and Saco, requiring considerable bridging, while the old P., S. P. had been constructed in the cheapest possible manner through the edges of towns and mostly on the surface of the ground to save the expense of cuts, which accounts for some of the grades on that line to this day. It is quite probable that in the exigency of the B. & M.'s haste to get to Portland that the landowners asked and received their own prices for the right of way. In no other manner could the have cost so much per mile.

With each of these roads owning an independent line, part of the way parallel between Boston and Portland, the rivalry waxed hotter than ever, even going so far that offers were made to some organizations to carry them the round trip free to prevent their going by the other route. These two companies at that time ran in connection with a steamboat line running to the provinces from Portland. Each had a track leading down to the wharf, and so intense was the rivalry for passengers landing from the boats that a rule was made that the roads should take turns in having their trains stand on the track nearest the side of the boat. An amusing feature, viewed in the light of subsequent events, of the time when the Eastern Railroad, refused to take the B. & M. passengers from North Berwick into Portland.

as President Brown of the Eastern saying to Superintendent Wm. Merrett of the B. & M. "that he and his railroad would have to come in with them out of the cold," which exulting remark seems to us to have been just a little "previous."

During this North Berwick fight the now general Passenger Agent Flanders at his telegraph desk at that place did all of the Boston & Maine wiring. In 1881 the present president of the Boston & Maine, Mr. Lucius Tuttle, was general passenger agent of the Eastern Railroad. The Boston & Maine by virtue of building branches, chiefly into the Eastern's territory, had in 1885 grown from its original main line mileage of 78 miles, to a small system of 200 miles. When the Eastern Railroad became bankrupt and was in danger of foreclosure, it was then considered a good time to lease it and "Barkis was now very willing" and the deal was consumated, bringing 250 additional miles into the Boston & Maine system, ridding it of an uncomfortable rival and making a total mileage of 450 miles. This gave the Boston & Maine absolute control of all the seacoast travel between Boston & Portland, a veritable bonanza.

But the spirit of absorption once born is not easily stilled in railroad life, and this lease was followed a year later in 1886 by the leasing of the Worcester, Nashua & Rochester (N. H.) Railroad, which added 100 more miles, making 550 in all, and giving the Boston & Maine access to the central manufacturing districts of Massachusetts, tapping the territory of both the Boston & Albany and the Fitchburg. It also gave it control of an inland route of travel from Worcester to Portland, which might have become a rival. The control of the Portland & Rochester (N. H.) Railroad was acquired by purchase about this time, adding 52 miles and completing the links of the Worcester-Portland chain, making its system now 602 miles. The Portland & Rochester has always, for economic reasons, been operated under its own name and as a separate road, although the Boston & Maine owns it and supplies most of its rolling stock. In 1887, after a stiff fight with the Concord Railroad of New Hampshire, the Boston & Maine obtained the Manchester & Lawrence Railroad, 26 miles, which gave it an entry into the Concord's field and a great New Hampshire manufacturing district, and really, so to speak, cut a limb off of that road, as the Concord had operated the Manchester & Lawrence for many years under a lease which had run out. This brought the Boston & Maine up to 628 miles, and as events turned out it was a most valuable acquisition, for the Concord road owed the Manchester & Lawrence much money which was in dispute and was in the courts. The final judgment in this matter was not rendered until seven years after the Boston & Maine possession, and it was a considerable factor in the final acquisition of the Concord system, for it was unable to pay the amount. But I am anticipating.

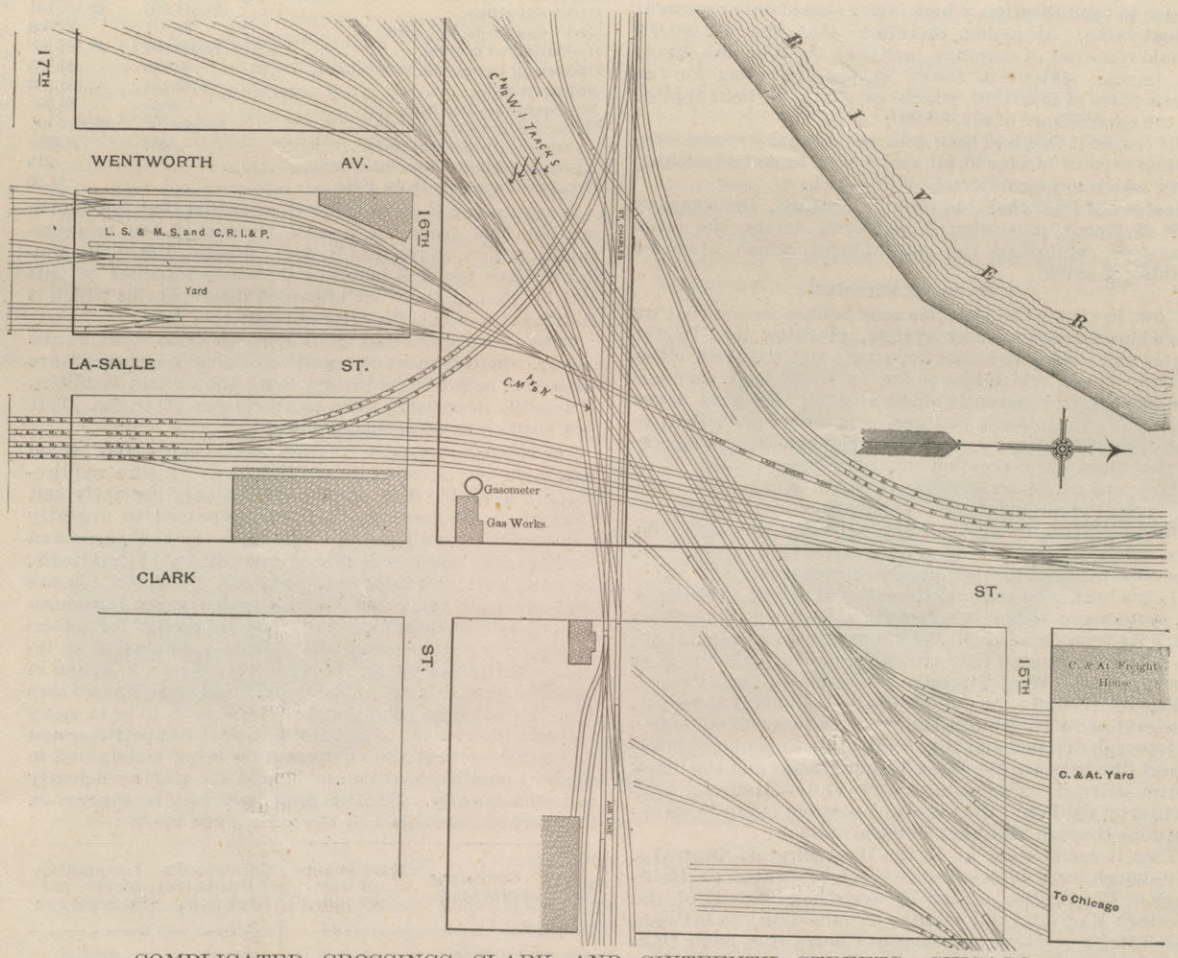
(To be Continued.)

TRACK ELEVATION IN CHICAGO.

The work of elevating the tracks upon the Galena division of the Chicago & Northwestern Railway between Sacramento avenue and West Fortieth street in Chicago was illustrated and described in the RAILWAY REVIEW of April 27 and May 4, 1895. This work involved the raising of 1.85 miles of track, and required 275,000 cubic yards of sand, which was brought from Dune Park, Ind. It will be remembered from the description referred to, that from West Fortieth street to Kedzie avenue five tracks were raised and six tracks were elevated between Kedzie and Sacramento avenues. The method of doing this work was unique in that all of the tracks were raised simultaneously and none of them were taken out of service consecutively for more than a day and then but one track was cut out at a time. The bridges were erected upon flat cars for one track at a time and lowered from them on to temporary supports of piles, which were afterward replaced by masonry abutments. The work was commenced April 15, and occupied but 100 days, the whole of it having been completed August 1.

The Rock Island and Lake Shore roads, which are working together in the elevation of their tracks from Sixteenth street southward, began work August 23, 1894, and the elevation is now completed up to Thirty-eighth street, where progress was stopped pending a final disposition of the stock yards tracks at Fortieth street. Bridges have been built at Archer avenue, Twenty-second, Twenty-fourth, Twenty-fifth, Twenty-sixth, Twenty-seventh, Twenty-ninth, Thirtieth, Thirty-first, Thirty-second, Thirty-third, Thirty-fifth, Thirty-seventh and Thirty-eighth streets. Other streets in this section do not cross the tracks and therefore did not require bridges. The subways at all these streets which cross the right of way have been lowered from their original level from three to five feet. The deeper depressions being for the purpose of giving head room for the electric trolley cars. All the sidewalks are brought down to the street level, except the one on the south side of Twenty-sixth street, which was kept at the original level on account of a brick building located near the tracks. On the east side of the right of way a retaining wall was built from Eighteenth to Twenty-second street, which varied from six to sixteen feet in hight, and on the west side of the tracks a similar wall was constructed between Nineteenth and Twenty-second streets. The method of elevating used on this work differed from that devised by Mr. L. H. Evans, upon the Chicago & Northwestern elevation. In this case two of the four tracks were elevated at a time for a distance of four blocks. Temporary bridges of timbers were built at the street crossings and the abutments were built in halves. As each section of two tracks was completed it was opened for traffic, and the other tracks were brought up to their level. The work was accomplished without delay to traffic in spite of the fact that portions of the track were taken out of service for a considerable time.

There are some serious difficulties to be encountered in the continuance of this work beyond its present southern terminus. Among these are the complications introduced by the yards between Thirty-ninth and Sixty-third streets. Also the Lake Shore road has a roundhouse and small yards near Forty-third street. West of the right of way near Forty-seventh street, are the shops of the Rock Island, and all of these features will introduce difficulties into the work which in that upon the Chicago & Northwestern was not encountered. Up to this time while the progress of track elevation has been highly satisfactory, the problems have been simple and easily solved. The roads have to a great extent taken the initiative in the matter, as there is at present no ordinance in force requiring general track elevation. An ordinance, however, was passed Feb. 23, 1893, providing for the removal of steam railway tracks from the surfaces of streets. This ordinance



COMPLICATED CROSSINGS CLARK AND SIXTEENTH STREETS, CHICAGO.

provides that all existing steam railways between Sixty-seventh street and Diversey avenue and east of Kedzie avenue, except the tracks in the stock yards district south of Thirty-ninth street may be removod from the surfaces of the streets by Jan. 1, 1897. This amounts to permission for the tracks to remain in the streets until the date mentioned. The city government desired to have the work of elevation pushed more rapidly and brought matters to a head in connection with what is known as the Sixteenth street crossing. The principal roads had arrived at the conclusion that they were ready to elevate their tracks for the purpose of eliminating grade crossings, but the stumbling block was the complicated crossing referred to. This was illustrated in the RAILWAY REVIEW of April 12, 1890, in connection with the excellent track work put in at that time by the Morden Frog & Crossing Works, but for convenience for reference a portion of the plan is reproduced here. There are thirteen railroads concerned in this complicated crossing, and by actual count five years ago there were found to be 1,063 engines, 1,202 coaches and 4,825 freight cars moved over this crossing in twenty-four hours. The fact that many of these tracks are main lines, and that several of them, such as the lead to the Lake Shore yard are in use at all hours of the day, makes this a most troublesome point. It is easily the worst crossing in existence, and a most difficult one to rearrange with a view of the separation of the grades.

The location of Clark street with reference to the tracks is shown on the illustration, and the construction of the electric trolley line on this street furnished the reason for taking up the problem vigorously at this time. Mayor Swift, of Chicago, in a communication to the city council dated December 16, 1895, pointed out the dangerous state of affairs at this point and suggested as a temporary remedy for the protection of the public that every train and locomotive approaching Clark street should be required to come to a full stop just before reaching the street, and that they should not pass over until properly signaled to do so. A draft of an ordinance covering this ground was transmitted with his message and passed by the council. The result had the effect desired by the city authorities and the engineers of roads concerned are now engaged upon a plan for the disposition of this crossing problem.

After settling upon the method to be pursued at this point the next step will probably be the passage of an ordinance under which track elevation may be rapidly pushed throughout the city, the work which the roads have signified their intention of taking up being as follows: The Rockwell street grade crossings between Kinzie and Twelfth streets, over which the tracks of the Pennsylvania Co., and the Northwestern Railroad now run will be eliminated and the Chicago & Northwestern will also elevate about 12 miles of its right of way within the city limits. This latter plan is the most extensive of all and it is stated that it will include the elevation of the Milwaukee division from Wrightwood to Rees avenue, a distance of four miles. The work on the Wisconsin division extends from Armitage avenue to Mayfair, a distance of about four and a half miles. These lines join at Clybourn Junction where the elevation will probably be continued on the main stem to Chicago avenue. The St. Charles Air Line will be elevated throughout its entire length, arrangements having already been made for the elevation across the tracks of the Illinois Central main tracks at Weldon in connection with the lake front improvements illustrated and described in the RAILWAY REVIEW of November 23, 1895.

THE STATUS OF THE BALTIMORE & OHIO RAILROAD.

In the issue of the Bond Record for December appears an exhaustive review of the Baltimore & Ohio system, written by Mr. Ernest S. Cronise, of New York City, from which we reproduce a summary, and the conclusion of the writer. The article bears evidence of an intimate knowledge of railway affairs, and though much too long for our columns is well worth the attention of those concerned or interested in the management of such properties. After discussing the entire system in detail, Mr. Cronise says:

Summariziug the results of this examination of the company's finances it is found that notwithstanding the fact that it has had increased resources of about $25,000,000 during the period under review (1889 to 1895 inclusive), with which to enlarge its facilities and earning power, it has not materially increased its earnings, as will be seen by reference to the income table, This being the fact, the question arises, what did the company do with these resources, and what property has it to show for this increased capitalization?

The balance sheet shows an increase in assets as follows:

Cost of road and equipment	$ 147,533
Terminals 1894	8,500,000
Bonds and stocks of other corporations	6,677,221
Advances for construction and permanent improvement on lines leased and operated	3,404,243
Current assets	5,829,566
	$24,558,563

this being the equivalent in book value of the resources of $25,000,000 which it had during these seven years.

Now, as the earning sources of the company were not materially increased by the acquisition of these assets, we must naturally examine into the character of these assets and see why their acquisition has not benefited the company.

1. We have the terminals of 1894. The value of this asset has been fully gone into heretofore, and it would appear to be demonstrated that the property covered by the mortgage was mortgaged considerably, say 50 per cent, in excess of its value.

2. Bonds and stocks of other corporations. The increase in this account was $6,677,221 in book value. The actual value of same, as has been demonstrated, is very small, as practically all the corporations issuing them are operated at a steady loss to the B. & O.

An attempt to place any value on this increase is impossible, especially as an accurate list of the securities cannot be obtained from the company.

Third.—Advances for construction and permanent improvement to lines leased and operated. The increase in this amount is $3,404,243.

This matter has been gone into fully heretofore, and it has been shown that as nearly all the subsidiary companies are operated at a loss, there is little prospect of ever recovering any of these advances.

The value of these three items then, valued at $18,500,000 by the company, would appear to be, say $5,000,000 for the terminals, which would seem to be a very liberal estimate, and allowing for increase in stocks and bonds of other corporations, say 25 per cent. of their book value, $1,700,000, and nothing whatever for the advances to other lines, etc., or a total of $6,700,000 actual value to represent the increase of $18,500,000 in capitalization, a difference of $12,000,000, which is practically a dead loss.

In this case it would appear that as the assets to the amount of $12,000,000 have practically no value, they should have been provided for out of earnings, and not by an increase in capitalization, which latter should only represent actual value. Assuming, therefore, that this $12,000,000 should come out of earnings, how does the company stand? Its income statement shows surplus earnings for the seven years of $9,500,000, which should have been applied on the expenditure of $12,000,000.

Of course if this had been done the company would have had no surplus income at all, and would have had nothing with which to pay dividends on its stock.

Instead of following this course, however, the company paid dividends amounting to $5,300,000 during the seven years and capitalized the expenditures which produced nothing of value.

CONCLUDING REMARKS.

Now, in view of all that has gone before, we see that we have here a large railway system, reaching into twelve states and joining the most important and populous cities of the country, which has, so far as traffic and earnings are concerned, apparently stood still for the past seven years, but whose fixed charges, gross current liabilities and other obligations in general have increased very largely in that time. The question naturally arises, what is its future, and can steps be taken that will avoid the inevitable result of a continuance of these two conditions?

In considering B. & O.'s future prospects, there are several points deserving very serious attention which have not thus far been touched upon to any extent.

It has been seen that at all principal points in the B. & O. system as a whole, it is brought into direct competition with its formidable rival, the Pennsylvania system. It can be taken for granted that ere long the latter will work down into the West Virginia coal field, practically paralleling the recently completed connection (the Fairmount, Morgantown & Pittsburgh Railroad), between the B. & O.'s Pittsburgh division and that section, thus opening another direct line between the West Virginia fields and the Pittsburgh district. The Cumberland Valley Railroad (controlled by the Penn. Rd.) is also a possible factor in its extensions through Southern Pennsylvania.

Then it would seem as if the West Virginia Central & Pittsburgh were determined to reach tidewater at Baltimore or Washington, either by acquiring control of the Western Maryland and building a connecting link between the latter's western terminus at Cherry Run (near Hancock) and Cumberland, or eventually securing the bed of the Chesapeake & Ohio Canal. If either line is built, and there is every reason to believe one of them will be, the B. & O. will have for the first time in its history, an active competitor for the business tributary to its Main Stem between Cumberland and tidewater, and in the former case it would be a line several miles shorter to Baltimore from the West Virginia field and many local points on the Main Stem of B. & O. Its advantage of distance and possibly improved location at some points would be partly offset by the Western Maryland's grades in crossing the Blue Ridge.

And finally the position of the Chesapeake & Ohio deserves special consideration. It is hardly necessary to refer to coal traffic competition from this quarter, beyond saying that in many respects the C. & O. is in a more favorable position regarding tidewater shipments from virtually the same section penetrated by the B. & O. coal branches. But the Chesapeake & Ohio is becoming a more active competitor for through freight and passengers between what are undoubtedly one of the most important termini on the B. & O. system, viz: New York, Philadelphia, Baltimore, Washington, Cincinnati, Louisville and St. Louis, and it is quite possible that the effect of this is seen in the traffic figures of the Parkersburg branch given on a preceding page. It is a question whether the Chesapeake & Ohio is not now in a position to cut into B. & O. traffic from its four eastern termini more seriously than the Pennsylvania. As is well known, that property since its reorganization has been brought up to a high state of efficiency, having but one object in view, viz: to handle the maximum train load over its successive divisions at a minimum cost per mile, and to this end every detail of its operation has been studied and subjected to the application of methods embodying the results of the best practice. The arrangement with the Virginia Midland whereby it now has running rights to Washington, and that giving it the use of the Pennsylvania's terminals, combine to greatly strengthen its position, and bring it into closer competition than ever with the B. & O.

In order to show what has been done with this property since its reorganization in 1889, there is given below a table containing some statistics of its operations in 1889 and 1895. Side by side are placed corresponding figures for B. & O. in the same years, to show more particularly the extraordinary growth and increase in efficiency of the Chesapeake & Ohio, but which also bring out some points in reference to B. & O. which indicate pretty clearly that unless radical changes can be effected in some of its methods, there can be no possible hope of increasing its earning capacity as a whole. Of course it may be argued that the two systems cannot be compared as a whole, and that in selecting the years 1889 and 1895, opportunity is afforded for making an unfair comparison; but an analysis of the intervening years will but serve to emphasize the leading features of this table, which are relative improvement in the efficiency of the systems since 1889, about which year each passed through a process of reorganization or readjustment.

	Baltimore & Ohio. 1889.	1895.
Miles main track	1,791	2,095
Passengers carried	8,922,062	8,207,608
Tons freight carried	12,161,380	16,080,423
Passengers, one mile	267,729,279	287,825,922
Tons, one mile	2,340,730,503	2,470,822,408
Gross earnings	$21,303,002	$22,817,182
Gross earnings, per mile	$11,855	$10,891
Operating expenses	$14,810,844	$15,801,044
Operating expenses, per mile	$8,264	$7,542
Net earnings	$6,492,158	$7,016,138
Net earnings, per mile	$3,591	$3,349
Expenses to earnings	69.76 per ct.	69.25 per ct.
Average rate per ton mile	.63c	.605c
Average freight train load, tons	190	136
Gross revenue per train mile	$1.08	$0.83½
	Chesapeake & Ohio. 1889.	1895.
Miles main track	895	1,360
Passengers carried	464,103	1,813,379
Tons freight carried	2,663 350	5,671,200
Passengers, one mile	48,549,251	93,268,067
Tons, one mile	611,932,670	1,420,788,401
Gross earnings	$4,314,696	$9,596,031
Gross earnings, per mile	$4,821	$7,056
Operating expenses	$3,549,560	$6,464,528
Operating expenses, per mile	$3 966	$4,753
Net earnings	$765,136	$3,131.503
Net earnings, per mile	$855	$2,303
Expenses to earnings	82 per ct.	67 per ct.
Average rate per ton mile	.540c	.425c
Average freight train load, tons	183	315
Gross revenue per train mile	.....	$1.20

In making up the above it will be stated that the figures are obtained from the annual reports of the two companies, which, as regards B. & O., present difficulties similar to those found in handling the other branches of this article; that is, there are apparent discrepancies which it is difficult to reconcile without additional data.

Thus it appears that Baltimore & Ohio must, in the future, squarely meet competition of a more serious nature than ever before in its history, with the certain condition of steadily decreasing rates on all classes of traffic. Is it in a position to do so successfully?.

The company's report for 1888 has a paragraph which sets forth very forcibly its position as to "future requirements" to enable it to handle its business promptly and efficiently. Its needs at that time appeared to urgently require the expenditure of large sums for new yards and side tracks, improvement and acquisition of terminals, new and heavier equipment, etc., etc. While it appears that amounts, averaging for the period under consideration, $1,500,000 per annum have been expended for betterments, they do not seem to have been so applied as to increase the efficiency of the property as a whole, and in some respects it is not doing as well as it was seven years ago. Its physical condition has been seen to be in many respects inferior to that of its principal competitors, and it is not clear that the equipment is being maintained in the best possible condition to handle its traffic efficiently and economically. Perhaps some light may be thrown on this part of the subject by the table given below :

Year.	Operating percentage.	Maintenance of way per mile.	Maintenance of equipment per mile.	Locomotive service per 100 miles run.
1889.	69.76	$1,533	$1,669	20.00c.
1890.	69.51	1,636	1,883	21.00c.
1891.	69.62	1,466	1,683	16.00c.
1892.	73.26	1,135	1,364	16.32c.
1893.	72.64	1,544	1,648	16.30c.
1894.	69.15	1,293	998	14.93c.
1895.	69.25	1,358	999	14.99c.

Now it is seen at a glance that all items of maintenance per mile, including locomotive service, have steadily decreased, the drop since 1893 being particularly noticeable. Such a table is perhaps possible of two interpretations, but in the case of B, & O. it is feared that there is but one, namely, that the property is being allowed to run down. If this is the case, there can be but one result in view of all that has gone before, and that is failure to successfully meet the competition which it must face, coming from new quarters, and in a more aggressive form than ever before.

In December, 1891, the president, upon his re-election, stated to the board of directors that "they had ample cause to congratulate themselves upon the condition of their property and its steady improvement in three years, physically, commercially and financially. No step had been taken backward." He stated, among other things, that "we can readily do $30,000,000 of business annually. We need not seek it; it is seeking us. We are refusing business because we have not the facilities for handling it properly. The difficulty is this: Locust Point is now the measure of what we are able to do;" and further, "I think it is safe to say by the 1st of July the company will be in condition to do business at the rate of $30,000,000 a year!" What is the trouble? Is Locust Point still the measure of the property's capacity, and is it still being hampered by lack of yard room and sidings?

The fact of the matter is that this magnificent railway property, possessing characteristics of location almost unequaled in the country, has never been given a chance to show what it could do. Its vitality, in the face of the mistakes of the past and a policy which has been blind to its possibilities and earning ability, has been astounding; but this cannot go on indefinitely, and the day is past business will seek it to the point of refusal. The time has come when its fate must soon be decided, and there are two ways to treat the case.

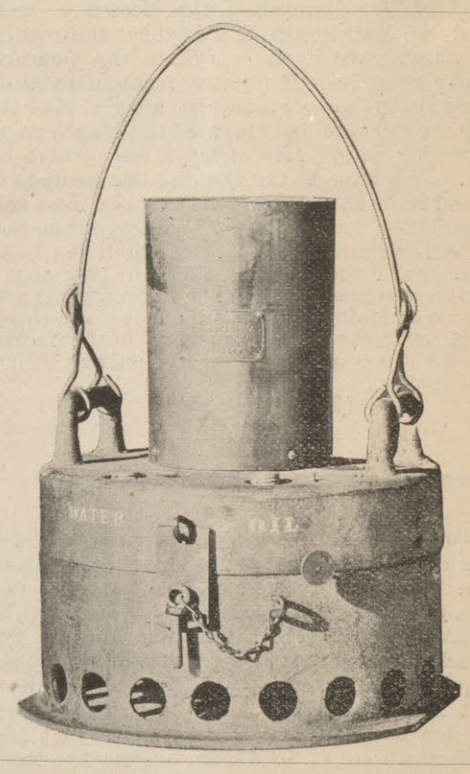
One is to bring the entire property in every detail of track, roadway, yards, terminals, equipment, up to the standard required by the best modern practice, permitting trains of 1,000 tons to be handled over successive divisions without a break, and schedules of through passenger trains which fully utilize the natural advantages of the system; to cultivate in every possible way the local traffic, passenger and freight, on all divisions of the system; to appreciate the fact that the moral effect of curvature on the traveling public is greatly modified by taking the trouble to "ease off" or re-locate badly laid curves, and that a clean looking roadbed is a better advertisement than photographs of distant views in the Alleghanies; and finally to eliminate a certain "personal equation" in B. & O. affairs, which, in its operating, traffic and finance departments, presents peculiarities that certainly have largely brought about the present state of affairs.

The other way is not to do any of these things; but the two methods are submitted as to which will bring B. & O.' earning capacity nearer the $30,000'000 mark.

The recent changes in the board of directors which provide for the representation of certain interests, is a hopeful sign, and may possibly mark the beginning of Baltimore & Ohio's Advent season. It is indeed high time to awake out of sleep, substituting for methods enshrouded in mystery and inconsistency, an up to date aggressive policy the effect of which shall be felt from end to end of this grand old property.

ECONOMY FREIGHT CAR HEATER.

The accompanying illustration shows the appearance of a freight car heater which seems to have some specially good points and evidently can be used to excellent advantage in the shipment of perishable freight during cold weather. It is an oil burning heater with a body 17½ in. in diameter, 9½ in. high, protected by a substantial iron casting. The stack is of sheet iron 7 in. in diameter and 10 in. high; the burner being 5 in. in diameter. Inside the burner is a 3 in. water tube fed from a water reservoir to prevent the overheating of the metal parts and providing for the immediate extinction of the flame should the heater be overturned. The oil reservoir holds



two gallons, which it is claimed will maintain a steady flame for about twenty-four hours. The reservoir is provided with a float for showing the level of the surface of the oil in the reservoir, and also with a convenient opening from which it can be filled. The size of the flame is regulated by a screw which appears on one side of the heater in the illustration, and it is claimed that the combustion is perfect at all times.

These heaters are set in the car in such numbers as are necessary, one or two being sufficient for an ordinary freight car. They are usually placed between the doors, as this is the coldest part of the car. In refrigerator cars they are placed inside the ice tanks by being lowered through the hatches, where they can be attended to without breaking the seals of the car. In these cars it is customary to open the traps in the drain pipe to allow an inflow of fresh air for creating circulation, but in a box car there is sufficient leakage for this purpose.

Fifty of these heaters have been in use on the Great Northern Railway for the past two years, and twenty-four have been added to the equipment this year. It is stated that during the time they have been in service no claim whatsoever has been entered for damage to cargo from the effects of cold or from smoke or bad odor. It is further claimed that on opening a car in which the heaters have been burning, it is impossible to detect either smoke or smell in the slightest degree. They are used not only for the protection of perishable freight in transit, but also for heating cars which have arrived at terminal points during severe weather. They are also used at terminals for heating up cars which are to be used for short distances, in which service the

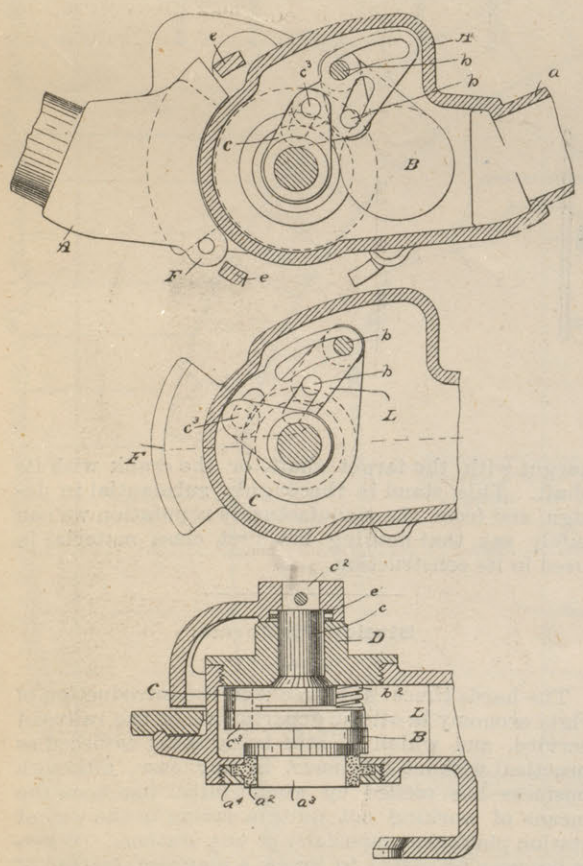
temperature is raised to about 45 deg., when the heaters are removed and the doors closed.

The heaters are compact and can be easily handled and returned at very slight expense and trouble. They cause much less trouble and expense and are also less dangerous than stoves, and it is claimed they will last much longer. A number of roads and also of shippers, are using the heaters, and Mr. Geo. F. Brown, general manager of the company, states that they have been universally satisfactory.

A COMBINED HOSE COUPLING AND VALVE.

With a view of doing away with the danger involved by the use of the angle cock upon air braked cars, the device illustrated herewith has been designed and patented by Mr. A. G. Kinyon and Mr. Henry F. Noyes, who had for some time been experimenting independently, and whose devices have been combined by Mr. J. M. Barr, general superintendent of the Great Northern Railway, to whom we are indebted for the information and drawings contained contained in this description. The object of the device is to provide a construction of hose couplings wherein the controlling valve corresponding to the usual angle cock is automatically seated or unseated during the operation of uncoupling or coupling, thereby avoiding the use of the angle cock and the accidents which may occur through its improper operation. Incidentally an advantage is gained by the elimination of the necessity for going to an angle cock and opening it after coupling the hose between cars.

In the accompanying illustrations Fig. 1 is a plan view showing two couplings in engagement, the shell of one of which is shown in section to expose the interior parts. Fig. 2 is another view of the right hand half of Fig. 1, showing the parts of this coupling when in the uncoupled position. Fig. 3 shows a vertical section of one of the couplings in its closed position. Fig. 4 presents the details of the interior mechanism drawn



FIGS. 1, 2 AND 3.—COUPLING AND VALVE.

separately so as to show the construction of each part. Fig. 5 shows two half couplings in the coupled position with the casing cut away from one of them. Fig. 6 shows a half coupling with the valve open. With reference to these illustrations the letter A designates the half shell of the coupling with the usual hose connection. This is also provided with the usual engaging lip and projection F, these parts being so made as to interchange with the couplings now in use. Referring to Fig. 3 a stem c^1 passes up through the cap D of the coupling and upon its outside end the lever E is fixed. The form of this lever is best shown in Figs. 4 and 5, where it will be seen to be forked at its lower end, and it is so formed as to conform to the outline of the shell so that when rotated with the pin c^1 it will for a limited distance swing free of the case. The ends e of the lever shown in section in Fig. 1 are arranged at a sufficient distance apart to straddle the flange F upon the other half of the coupling, when the two halves are brought together to be coupled.

In the act of coupling it is this lever E which moves the valve referred to. In the act of coupling the two shells are brought together in position to be rotated upon each other, which movement affects the fastening. This rotation causes the flange F upon each half of the coupling to rotate the letter E, which rotates the stem c^1 to which the crank C is attached upon the inside of the coupling. This crank operates the valve B by means of the cam motion shown clearly in the illustrations. The valve B is

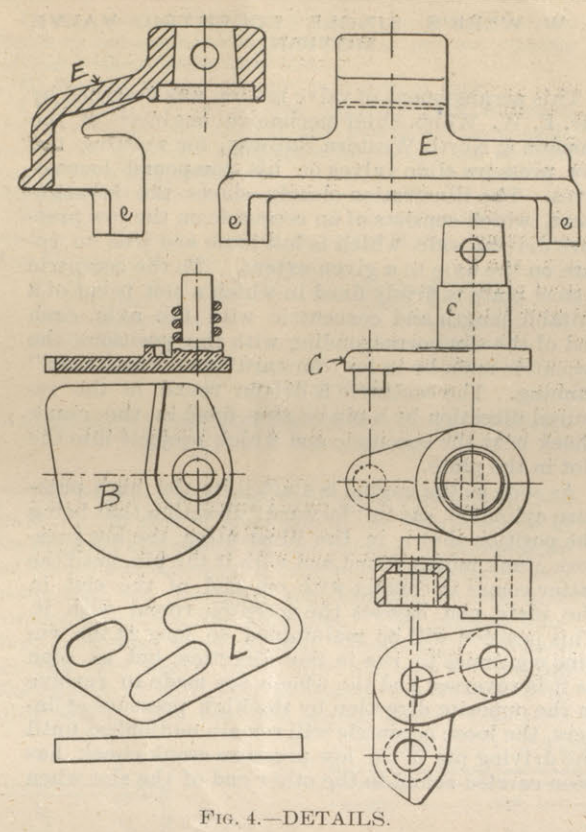


FIG. 4.—DETAILS.

carried by this mechanism into either of the positions shown in Figs. 1 and 2 by means of the crank pin c^3 which together with cam L carries it over the opening in the coupling as shown in Figs. 2, 3 and 5, or removes it therefrom as in Figs. 1 and 6. When in the closed position as in Figs. 2 and 3, the valve corresponds to the position of the lever E when the couplings are separated, the valve being removed from the opening by the act of coupling. The arrangement of the parts is such as to withdraw them as far as possible from the path of the air when the couplings are engaged and when they are separated the valve B is brought immediately over the rubber

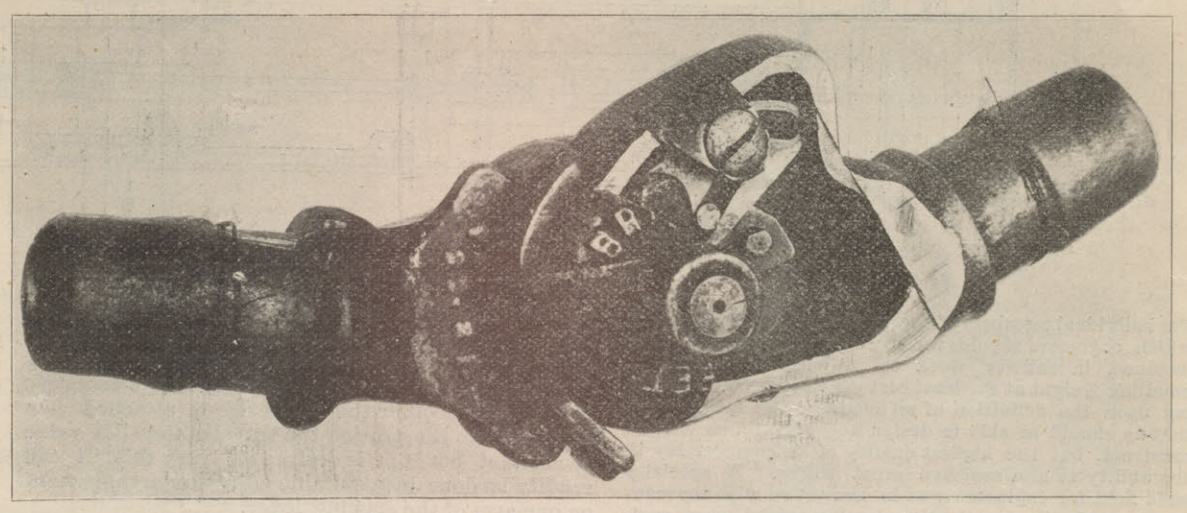


FIG. 5.—COUPLINGS SHOWN TOGETHER.

gasket a^2, against which the valve is initially urged by the spiral spring b^2. When once seated, however, the tightness of the joint is increased by the pressure of the air. The leverages obtained by the arrangement of the slots and the location of the studs b and b^1 are such as to give the maximum power from the movement of the lever E at the moment that the valve B starts to unseat, this being the time when the valve is under the greatest pressure from the air and hence is hardest to move. After the valve is opened slightly the equalization of pressures enables it to be moved against the friction of its

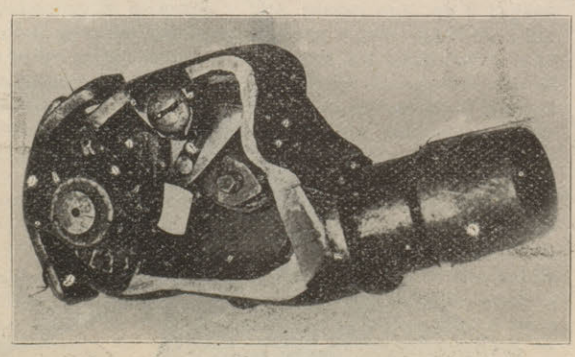


FIG. 6.—SHOWING VALVE OPEN.

parts only. The gasket is employed for the double purpose of making a tight joint for the valve and also between the two halves of the coupling. The gasket is not made exactly as shown in the illustration. It is held in place by a brass ring in a manner similar to that shown. This design is the result of the combination of the principal features of several similar devices worked out by these gentlemen in some of which air passages were more or less ob-

structed and in which the positive cam motion for both opening and closing the valve was lacking.

In discussions about air hose connections the use of the dummy coupling has occupied a prominent position from the necessity which certainly exists of keeping an open coupling up out of the dust, yet the employment of the dummy causes considerable damage to the hose from kinking, and this has proved so troublesome on many roads that the dust is preferred to the certain damaging of the hose. It is not necessary to argue that angle cocks are dangerous as this fact is well known, and a satisfactory coupling which does not require to be hung upon a dummy and which will automatically close the train pipe has a wide field before it. There are certain questions about a device of this kind which can only be decided by continued service covering a long period, but with the positive motion, the ample size and strength of parts for the work that they have to perform, this device would seem to meet the requirements in the case. It has been urged that after lying some time upon a side track couplings equipped with this device might give trouble when again put into service, but it is difficult to see wherein the interior parts of the coupling should suffer more deterioration than other parts of air brake equipment, as, for instance, the triple-valve. The interior parts are always protected from the weather because of the closing of the valve when the couplings are separated. If it is argued that this swinging lever may become bent it must be remembered that this is also true of the handle of the angle cock, but in this combination device the lever occupies such a position as to admit of its being made of sufficiently large proportion to guard against such a possibility.

One of the strongest claims made for this device is that the saving which may be effected over the cost of the ordinary couplings and angle cocks will amount to over $2 per car. The other claims made for the device are summed up as follows: It displaces and eliminates the angle cock saving the hazard connected with its use. When the train pipe is connected with the engine the application of the brakes is assured, as far as continuity of the train pipe is concerned, by the coupling of the hose. Dust and dirt are excluded from the train pipe altogether. The kinking of hose from hanging in dummy coupling is avoided. The device was originally gotten up by Mr. A. G. Kinyon, it has been improved by embodying the ideas of Mr. Henry F. Noyes and Mr. J. M. Barr. The latter gentleman controls the patents. The coupling has been used to a limited extent in service and is reported to have given satisfactory results.

The Western Society of Engineers.

The annual meeting and banquet of the Western Society of Engineers was held at the Auditorium Hotel in Chicago, on the evening of January 8, and the announcement of the result of the letter ballot for election of officers was made at the brief business meeting which preceded the banquet, as follows: President, Mr. J. F. Wallace, chief engineer Illinois Central Railroad; first vice president, Mr. T. T. Johnson, assistant chief engineer sanitary district of Chicago; second vice president, Mr. Alfred Noble; secretary and librarian, Mr. C. J. Roney; treasurer, Mr. Emil Gerber, and trustee, Mr. Horace E. Horton. The new constitution and by-laws were adopted and resolutions were offered expressing the thanks and appreciation of the society for the courtesies tendered it by the Armour Institute of Technology, in connection with the meetings which had been held at that school, and to the entertainment committee of the society, thanking them for the efficient manner in which the work of the year had been done. The business meeting was followed at 7 p. m. by a banquet, to which members and guests to the number of 120, sat down, after which a number of very enjoyable addresses were listened to.

The first speaker was the retiring president, Mr. Horace E. Horton, who briefly outlined the important works which had been carried out recently by members of the engineering profession with special reference to the important canal enterprises which had been completed, are now under way or are still in the preliminary stages. After briefly reviewing the year's work of the society the speaker introduced the new president, Mr. John F. Wallace, who was received with applause, and took charge of

the ceremonies. Mr. Wallace delivered an interesting and instructive address, which was fitting to the occasion, and which treated specially of the opportunity and duties of engineers in general, with regard to their profession, and having special reference to individual application by the members of the society. While the ostensible object of the society was the advancement of the science of engineering, the real object was the advancement of the interests of the individual members, and it was urged that in the future work of the society more attention should be given to the enlargement of the library by the addition of books, maps and documents. It was suggested that the library might be incorporated for the purpose of assisting in enlarging the collection, with reference to government publications. The necessity of obtaining good papers was next urged, together with general discussion of interesting questions. Improvements might be accomplished by co-operation of the members, and the fact that topical discussions upon proper subjects were often of greater importance and value than carefully prepared papers, was pointed out.

In the education of engineers, courtesy, loyalty and knowledge of men and affairs was thought to be too much neglected. A high place was given to technical knowledge in preparing for engineering work, but this was given the place in an engineer's preparation similar to that of the tactics in that of military men. The tactics were important, but without the broader strategy necessary to their proper understanding and application they were of little use. More attention was to be paid to strategy or diplomacy, or else assistant engineers would remain assistant engineers. Across the water the professions were known as engineering, the church, medicine and law. Here the order was the law, medicine, the church, and a majority of the people did not know what an engineer was. The status of engineers in this country was largely in the hands of the individual members of the profession. The object for which engineers should work was a practical one. For instance, in railway work to so build as to admit of handling freight at the least cost per ton per mile. Touching upon the definition of an engineer the speaker said that he should be able to design and execute, as well as construct, but the highest quality of an engineer lay in the ability to also conceive great works. A specially wide field for engineers was in connection with the management of railways, the time having passed when engineers should be expected to become useless to railroads upon the completion of their construction. Among the influences which had been exerted by the society was that in connection with the important work of the elevation of tracks in Chicago, with which many of the members were intimately connected, and which was rendered possible largely by the work which had been done by the society.

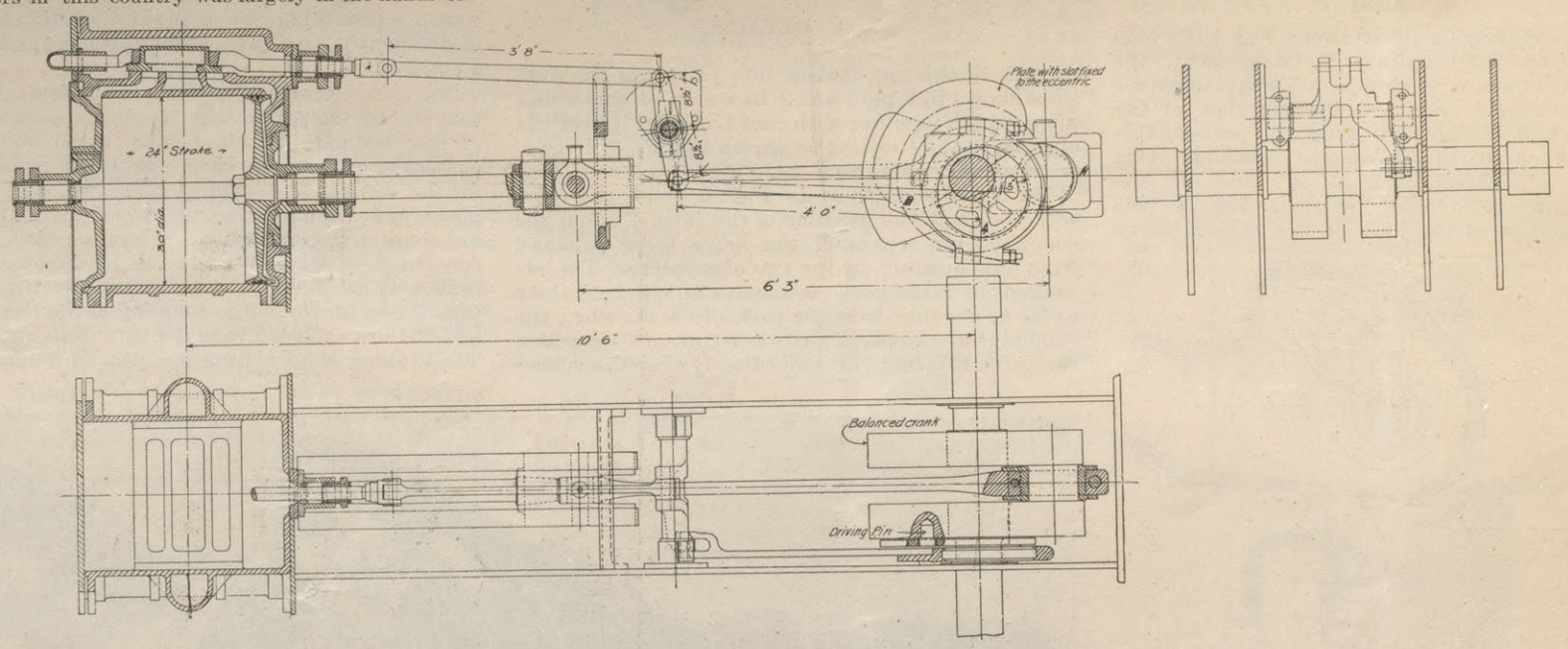
Hon. D. P. Phelps, of Chicago, was next introduced who gave an address in which the great importance of the work of this profession was recognized, and in which higher duties than those pertaining to the interests of individual members of the society were set forth. Mr. Geo. M. Carman of the Lewis Institute, and Mr. Thomas C. Roney, dean of the Armour Institute of Techology responded in behalf of technical schools. The latter gentleman spoke of the work of the Armour Institute, which was engaged in the education of engineers. Being but three years old, it had not yet sent out any graduates, but he desired to correct an impression which seemed to exist in the minds of some, that this was merely a manual training school. It is much more than that. Mr. Reynolds followed with a report of the publication committee in which the plans for publishing the society's journal were explained. The remaining addresses were by Messrs. A. Mordecai, Isham Randolph and R. W. Hunt, the latter gentlemen responding in his characteristic happy manner. Mr. Randolph briefly stated the present condition of the construction work on the Chicago drainage canal, of which he has charge as chief engineer, and he took this opportunity for giving the credit which was due to his able assistants in the prosecution of the work. The entire evening was enjoyable and was such as to inspire the membership with feelings of loyalty and enthusiasm with regard to the future of the society.

Tempered steel can be readily drilled with a drill of crucible steel slowly heated at its tip to a cherry red, and then dipped—but the tip only—into mercury, the whole drill then being thrown into water. There is no need to reheat the drill, but its point will be found to be quite hard enough to deal with steel tempered in the usual manner.

F. W. WEBB'S SINGLE ECCENTRIC VALVE MOTION.

This arrangement of valve motion was designed by Mr. F. W. Webb, chief mechanical engineer of the London & North Western Railway, for working the low pressure slide valves on his compound locomotives. The illustration clearly shows the arrangement, which consists of an eccentric on the low pressure driving axle, which is left loose and free to rotate on the axle to a given extent. To the eccentric a steel plate is firmly fixed in which a slot is cut of a suitable length and concentric with the axle, each end of the slot corresponding with the positions the eccentric must be in for "forward" and "backward" running. The eccentric is driven round in the required direction by a pin or stop fixed in the crank cheek next the eccentric and which projects into the slot in the plate.

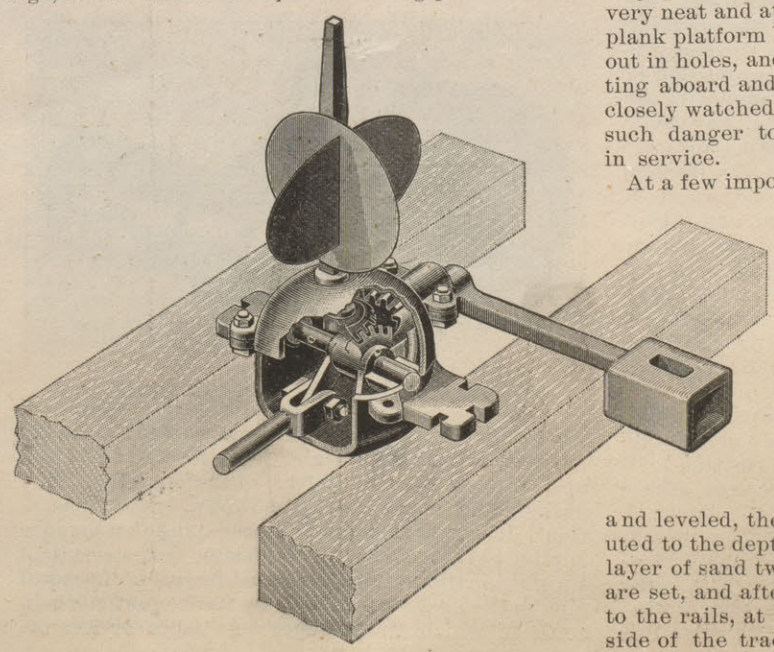
As soon as the engine is started by the high pressure cylinders, say in "forward" direction, that being the position shown in the illustration, the low pressure crank moves round, and with it the pin, until the latter comes in contact with one end of the slot in the plate and carries the eccentric round with it. This position will be maintained so long as the engine continues to run in that direction, but as soon as it is reversed and the wheels are made to revolve in the opposite direction by the high pressure cylinders, the loose eccentric will remain motionless until the driving pin in the low pressure crank cheek has been carried round to the other end of the slot when the eccentric will be driven in the opposite direction. The motion of the eccentric is imparted to the slide valve by means of an intermediate rocking lever, to one arm of which is coupled the eccentric rod and to the other the valve rod is attached. As shown in the illustration the travel of the slide valve is constant, but if it is desired to vary this, it can readily be done by a suitable adjusting arrangement on one arm of the rocking lever.



WEBB'S SINGLE ECCENTRIC VALVE GEAR.

AUTOMATIC GROUND THROW SWITCH STAND

We show by the accompanying illustration the Weir Frog Co's latest design of automatic ground throw switch stand. This stand should meet with the favor of operating officials, from the fact that it sets very low with reference to the track, and is especially convenient for yards for which it was designed. It interferes as little with switchmen as any form with which we are familiar. It will be noticed that the case of the stand is provided with lugs, which admits of a portion being placed below the top of the head blocks, thus reducing the hight of the stand, and also allows of the connection with the crank being made on a level with the head rod, without any bend or crook in the connecting rod. The operating parts are simple and not apt to get out of order, and being raised above the bottom of the case, they will not become clogged with snow or dirt. The gears are made of steel to reduce wear and increase their durability. The weighted handle throws into position parallel with the track, which is a great help to switchmen in yards, and the operating crank of the stand has its movement in a vertical plane. Its operation can be of the positive order, when locked by means of lever catches, or by their use can be locked for either track, main or side track as desired.



The manufacturers claim the following among advantages for their stand: first, the crank shaft is rigidly supported in the base of the case, and close to the line of support thereof on the ties; second the construction of the case furnishes a rigid support for a horizontally moving shaft, having a vertically moving crank, this of course gives a vertically moving connecting rod. By dividing the case on the center line of the lever and crank shaft the switch stand may be easily taken apart without removing the target from its shaft. The target is removable with the top part of the casing, leaving the crank shaft and lever shaft in position with their gear connections. By this construction the case can be taken apart without disturbing the connection of the target with the target shaft, or the crank with its shaft. This stand is thoroughly substantial in design, and from the manufacturers reputation we can safely say that nothing but first class material is used in its construction.

Station Platforms.

The hards times which caused the introduction of rigid economy in all the departments of the railroad service, and which is still being being enforced as practical without detriment in any case, although business has picked up wonderfully, has been the means of working out quite a saving in the way of station platforms, especially at way stations. When it becomes necessary to renew a platform, instead of using 2 in. pine plank, which costs from $18 to $20 per thousand feet, engine cinder or limestone ballast screenings are used as a substitute, and the cost of maintaining is reduced to a minimum. We prefer the screenings, as they wear better, and when properly placed in position and trimmed up, present a very neat and attractive appearance. When a pine plank platform begins to decay it is liable to break out in holes, and becomes dangerous to persons getting aboard and alighting from trains, unless very closely watched and kept patched up, but there is no such danger to be feared where the screenings are in service.

At a few important stations paving brick are being substituted for plank platforms, presumably as an experiment. At Federal street station, Allegheny City, on the West Pennsylvania division, the old plank platform which is quite an extensive one, is being removed and replaced by red brick manufactured to order. The dimensions of these brick are 9½x4¼x4 in., and have been subjected to a thorough test as to absorption, abrasion and compression. After the planks are lifted, the grounds are cleared up and leveled, then a layer of gravel is evenly distributed to the depth of six inches and tamped; next a layer of sand two inches in depth, on which the brick are set, and afterwards grouted. Along and parallel to the rails, at a distance of about one foot on each side of the tracks, a line of sandstone curbing has

been constructed so as to hold the paving solidly in position, and screenings or cinders will be used to trim up between the rails. A portion of this platform is now in service and seems to give good satisfaction. The heavily laden baggage and express trucks seem to be as easily handled thereon as on the pine plank. However, the staying and wearing qualities of this platform will be watched with interest. Before the improvements above mentioned at this station were commenced, the baggage room and office was moved thirty feet further east from the main building, for the sake of greater convenience in receiving and delivering baggage and express matter, and give more room for passengers, during a rush of business, to get to and from the train shed. At the same time a substantial stone wall about four feet high was built on line with Penn street and back part of the baggage room, from the main building to the ice house, a distance of about 100 ft., and finished with coping.—H. N. Miller in Roadmaster and Foreman.

In the plans for the Illinois Central lake front improvements in Chicago, described in the RAILWAY REVIEW of November 23, 1895, the selection of the streets opposite which viaducts would be built was stated to be undecided. The question has now been settled by agreement between Mr. J. F. Wallace, chief engineer of the road and the authorities of the city of Chicago. The viaducts are to be built opposite Madison, Van Buren and Harrison streets and Peck court.

Freight Car Doors and Attachments.

The committee of the Master Car Builders' Association on freight car doors and attachments, has issued the following circular of inquiry: To the members of the association: Your committee, appointed to report on the latest improvements and best practice in freight car doors and attachments, requests that you will co-operate by replying as promptly as possible to the questions given below:

1. Give your experience and the results obtained from the use of the different freight car doors in use on your road.
2. What style of door do you prefer—the overhead hung, the bottom hung, or other style hung door, and why?
3. What style of door or doors are standard on your line, and what are their advantage over other doors?

Please furnish blue prints, sketch or full description of your standard door or doors, including end doors and attachments, covering the following detail:

A. Size of doors and style of construction.
B. Style of hangers used.
C. Style and shape of rail and size of same.
D. Method of securing rail to body of car.
E. Locks and their attachments and method of application.
F. Stops, both front and back.
G. Brackets at bottom of door, including common brackets and special safety brackets, to prevent opening of door without breaking of seal.
H. Wedges, shoes, etc., used on bottom of door.
I. Description of any peculiar construction of bottom of door where it runs into brackets or on rail.
J. Description and name of any patent device in use in connection with door hangings or fastenings, not brought out by preceding questions.

Please forward replies to F. H. Soule, general car inspector, N. Y. N. H. & H. R. R., New Haven, Conn., before February 20, 1896.

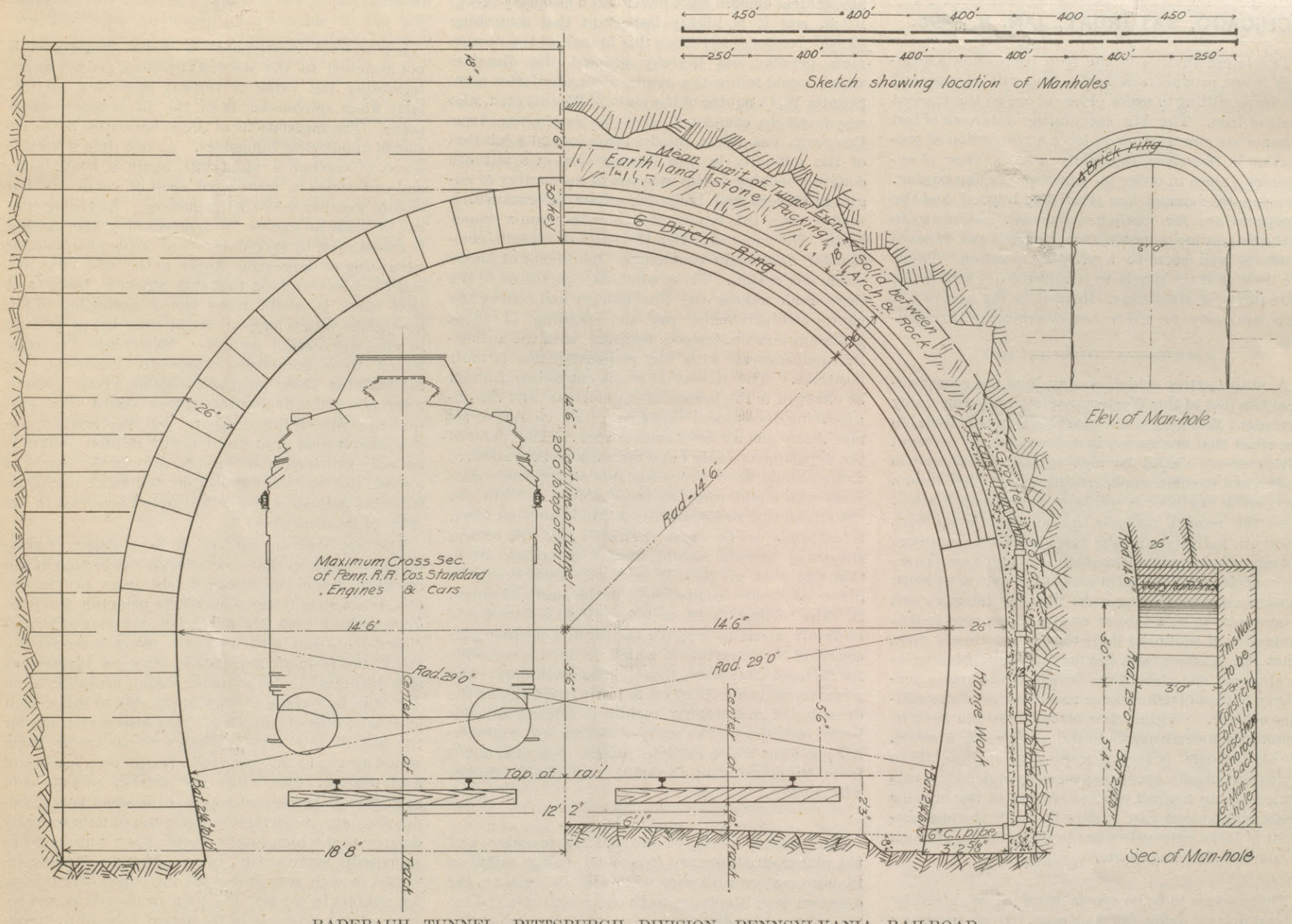
F. H. SOULE,
J. J. CASEY,
W. J. ROBERTSON,
B. E. THOMPSON,
THOS. FILDES,
CHAS. WAUGHOP,
A. J. CROMWELL,
MORD. ROBERTS,
Committee.

ALIGNMENT IMPROVEMENTS ON THE PENNSYLVANIA RAILROAD.

The Pennsylvania Railroad as is well known ,has paid a great deal of attention to the improvement of its original alignment for the purpose of elimination of curves and recently a number of plans have been completed for changing the location of the line, among which are the following. The present location between Nineveh and Conemaugh Furnace gives a very sharp curve into Nineveh and besides the change at this point to smaller curves are to be eliminated. The contract which covers this work also includes taking out two curves near Radebaugh. The smaller one of these has a curvature of 3 degrees and 30 minutes. The larger one, an 8 degree curve, is to be taken out and a tunnel 2,100 ft. long is to be substituted. One short 3 degree curve is to be taken out and one of 5 degrees changed to one of 30 minutes. The total decrease in length of line on this section is 1-5 of a mile and the saving in curvature will be 230 degrees. This part of the work is on the Pittsburgh division and the illustrations herewith show the construction which would be followed in building the tunnel referred to. This tunnel consists of a three center arch of six rings of brick with a 30 in. key stone. The thickness of the brick lining is 26 in. The main portion of the arch is semi-circular upon a radius of 14 ft. 6 in. which runs into an arc 29 ft. diameter at each side which is placed upon a short straight footing with a batter of 2¼ in. per foot.

The mean limit of the tunnel excavation is a semicircle 18 in. from the outer brick ring, and the packing between the arch and rock at the flanks is to be of earth and stone, which will be placed upon a solid grouted filling about 8 ft. high at the lower sides of the arch. This grouting is pierced at intervals with a 4 in. cast iron drain pipe which opens through an elbow at the bottom into a 6 in. cast iron pipe which leads the drainage water into the gutters of the tunnel. The lower part of this grouting is but 12 in. thick as shown in the half section view. The other half of this view shows the elevation of one-half the portal and gives the maximum cross section of the Pennsylvania Railroad Company's standard engines and cars. It will be seen that the tunnel is double tracked with tracks at 12 ft. 2 in. centers. The rise to the top of the arch at the center is 20 ft. Twelve inches is allowed for ballast under the center of the ties. The gutters are 8 ft. deep. Beside the large view a sketch is given showing the locations of man holes and two views of the man holes are also presented. The arches for the man holes are of four brick rings for which purpose very hard brick is used, and as shown in the section, a wall is to be constructed 18 in. in thickness in such cases as may occur where there is no rock back of the man hole. The rise of the arches of the man holes is 3 ft.

In the section of line between Portage and Lily stations on this same division seven curves are to be taken out and the line so straightened as to shorten the distance between these two points by 1.11 miles. On the Philadelphia division quite extensive changes are also contemplated. All the masonry required is to be founded on solid rock, or piles and grillage, and is to be according to the rigid specifications issued by Mr. William H. Brown, chief engineer of the road, to whose courtesy we are indebted for the illustrations which are here presented. The bids for this work have been opened and the contracts have been awarded to about a dozen firms. The contracts provide for straightening the curves on the Philadelphia, Willmington & Baltimore Railroad, between Elkton, Md., and Iron Hills, a distance of three miles. The new track will be comparatively straight where now it is almost a continuous curve. Between Leman Place and Kurzcis Station a large curve will be taken out, and the road bed not only straightened, but moved farther north, necessitating an excavation of 300,000 yards and an embankment of the same size. By this change the distance will be shortened one-third of a mile. At Mount Joy the roadbed will be entirely changed and will pass through the middle of the town from end to end. All grade crossings will be avoided, and light iron overhead bridges will be erected.



RADEBAUH TUNNEL, PITTSBURGH DIVISION, PENNSYLVANIA RAILROAD

Probably the first attempt to make practical use of the great energy of the tides is now being made on the Pacific coast at Santa Cruz. A dynamo, to cost about $20,000, is now being placed in position. It will be worked by a head of water raised by the tide, and the electrical energy thus obtained will be employed in lighting the town and driving the street cars. That, at any rate, is the idea, although whether it can be successfully carried out remains to be seen. The apparatus will be completed, and, it is expected, in full operation, early next month.

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CHICAGO, SATURDAY, JAN. 11, 1896.

THE latest advices in the iron trade show a deadlock in ore, producers believing iron will advance and not being willing to make prices of ore on the present basis of iron. The big speculating interests of last summer are now anxious to force a restriction of production in Bessemer, especially with a view of enhancing values in order to stimulate spring buying. The general demand in a retail way is good, and the prospects are for further expansion. What to do with the enormous production of mill and furnace products will soon be a pressing question. There are two or three snarls to straighten out within the next thirty or sixty days. Meanwhile big buyers will step cautiously, for there are emergencies threatening.

A SUGGESTION which was made at the recent annual banquet of the Western Society of Engineers by President Wallace, noted elsewhere in this issue, to the effect that engineers, in order to secure personal advancement, should be able to conceive as well as design and execute work, coming as it does from a successsful engineer is specially worthy of attention. Also the remark made by the same gentleman with reference to the reason why some assistant engineers always remain assistant engineers is appropos. To secure preferment and advancement a man must show himself capable of doing more than routine work, and there seems to be a danger among young men in this profession of confining their thought so closely upon what Mr. Wallace calls the tactics of engineering as to shut out the view of the broader and equally necessary field, which he likens to strategics of the military science. While close attention to the work in hand, which corresponds to the tactics for a subordinate engineer, is very necessary to success, there is unquestionably a tendency among young men of this profession to neglect the cultivation of the broader fields which alone can qualify them for the management of large enterprises or the undertaking of work of considerable magnitude.

There seems to be no special good to be gained by attempting to define an engineer, but an inspiring statement of what a good engineer is was given at the banquet referred to in a quotation from an address by General Francis A. Walker presented in the remarks of Mr. T. C. Roney, dean of the Armour Institute of Technology, as follows: "A great engineer must be a great man. All great engineers, according to the testimony of those who knew them, have been great men. The greatest engineers of the world's history have been very great men. The responsibilities they have had to bear, the choices they have been called to make between widely different ways of reaching the object sought, the portentious consequences of any mistakes they might commit, the unique character of any important engineering work, which reduces the value of precedent to a minimum, and, I might add, that in a large proportion of engineering enterprises, it is the faith and courage and enthusiasm of the engineer which carries his constituency with him and causes it to be decided that the work shall be undertaken and the means found. All these conditions make demands which can only be met by men of calm mind, of large views, of highly conservative yet boldly daring temperment, of thorough self-mastery, of great power over others. These are in part the gifts of nature; but they are also in great part *the fruit of culture*." We may be permitted to add that the problem which is to be met by the engineer is well stated in one of the epigrammatic sayings of the late Ecly B. Cox: "Not knowing exactly what you want to do or the material you have to do it with, what is the best way of doing it?"

THERE has been a general tendency with those whose employment does not necessitate rough work of any kind to look down to some degree upon men who are obliged to soil their hands by manual labor. This is very noticeable in the atttiude which is assumed by the line officers of the navy toward the engineer officers, the latter being to a large extent hampered in the performance of their duties by the authority which is given to the other officers over them. The fight for the rights of the engineers has been rather a bitter one and it has tended to prevent the full appreciation of the importance of this importance of this department in the design and the operation of the machinery of war ships. New conditions require new methods of treatment, and the extent to which the modern war vessel depends upon machinery renders it imperative that the best of men should be secured to manipulate and control it. The mechanical officers have never been properly recognized, and it is highly important that something should be done to render this branch of the service more popular and thereby prevent the disasters which would follow the employment of inferior men. Senator W. C. Squire of the state of Washington, who was formerly connected with the Remington Arms Company, has taken the first step toward a solution of the difficulty by the introduction of a bill into congress looking to the increase of the number of engineer officers and including other reforms which tend to place this branch of the service upon a proper basis. He would establish the titles of captain, commander, lieutenant commander, lieutenant of junior grade and ensign. These would be equivalent to the same rank among the line officers and convey the rights and privileges, pay and standing of these grades as now understood, together with the authority commensurate with the responsibilities of their positions. The bureau of steam engineering would be changed to the bureau of engineering, and the engineering department would be given charge of all machinery and all mechanical work. The chief of the department would have the rank of rear admiral and he would have two assistants as inspectors generals who would rank as commodores. While not not attempting to discuss this bill in its present form, it certainly seems most desirable that the reform suggested therein should receive immediate attention and that all possible encouragement should be given to secure competence in the engineer corps. A ship costing three or four million dollars would certainly seem to require the highest psssible personnel of the department which is held responsible for its most vital parts, namely, the machinery. The government can well afford to exert itself also in the direction of encouraging technical schools to offer better facilities for the study of mechanical engineering problems which refer to marine practice, and it is to be hoped that the effort made by Mr. Squire will not fail.

THE relative merits of the milling machine and the planer or shaper are frequently being called up in conversation with shop men, and in looking the question over it appears to be one which might form the subject of endless argument, yet the underlying principles upon which the decision as to which machine is the best to put in for certain work are based do not necessarily offer great difficulties for solution. The planer as a rule cannot do as rapid work as the milling machine, neither can the latter do all the kinds of work and to equally good advantages as the former, therefore if but one machine is to be furnished the planer would probably at this time be the best to purchase. There are very great advantages, however, to be obtained by the proper use of a wellequipped milling machine, and it is believed that its merits are not as well understood or as thoroughly appreciated as they should be. Proper equipment, in this case, involves the making of a large number of special cutters, but while these will make it appear to be a very expensive machine, for the first few pieces turned out, it should be remembered that these cutters last a long time under good treatment and the larger the number of cutters the larger will be the field of usefulness of the machine. The greatest advantage of this machine is in the rapidity of its work. It has been claimed that milling machines have been run up to eighteen inches travel per minute of the table carrying the work, and in this respect it is upon the same basis as the turret lathe. Upon both of these machines the limit of cutting speed does not seem to have been reached. The Daniels planer furnished the first example of the application of the principle of the milling machine as was pointed out by Mr. Wm. Kent at the meeting of the mechanical engineers in Detroit last June, and there is ample evidence that the milling machine has not only come to stay, but that its use will be more general as its merits become better known. It has been claimed that it is applicable only to special work involving considerable duplication, but this is not true. The fact that work may be so quickly clamped in the vise and the proper cutter set and work done renders it one of the handiest machines in a shop. Its operation must not be intrusted to boys in order to bring out its best results, but rather to experienced men. It should be provided with enough cutters, and if it is well designed so as to stand up to its work it will not be the machine which will be allowed to become the dust collector of the shop. This office will be much more likely to be filled by the shaper and it is very probable that the planer will eventually be crowded out by the milling machine to a considerable extent.

SPECULATIVE CONTROL OF INDUSTRIAL SECURITIES.

It is at least questionable if undue importance is not attached to the state of the stock market as determining the value of railway securities, particularly when considered from the investment standpoint. The fluctuations of these securities is the result of numberless influences. At one time it is a war scare, at another a tariff bill, again a bond issue, and sometimes a protracted spell of wet or dry, hot or cold weather answers the purpose. Anything that can be made an excuse for manipulating the market is seized upon by speculators and made available for advancing or depressing stocks as the case may be, and therefore we hear that this stock is lower and that stock is worth more money according to the quotations which happen for the time being to rule in the speculative markets. Meanwhile the roads which these securities supposedly represent, are maintaining their normal condition wholly without reference to the fluctuating figures stated to represent the value of the property; but does anyone suppose that a road capitalized at fifty million dollars is actually worth more or less because in the course of a week the figures marked on the stock exchange bulletins indicate a rise or fall of ten per cent. in the price of its securities.

The fact is we are coming to be a nation of gamblers; so much so that a very large proportion of the so-called trades in stocks, bonds, grain provisions, etc., is scarcely if any removed in principle from the games which from fear of the law, are played behind closed doors and in back rooms. Were it not for the fact of the intimate association between investment and speculative deals, there would probably be no difficulty in making the law applicable to this as well as other forms of gambling. And also were it not for the fact of this same intimacy no particular harm would accrue to the properties themselves because of such trading. But while the market quotations of securities in no respect represent or affect actual values they are, nevertheless, made use of to practically destroy that which honest people have purchased as supposedly representing value. Many a fortune invested in such securities with the object of providing for comfort in old age, has been swallowed up, not because of any decrease in the actual value of the property represented by the securities, but because speculators had so manipulated the property and the market as to destroy the value of such securities.

A more important because more influential consideration, is the effe ct of these manipulations upon our credit abroad. Not that speculators are unknown across the ocean or that the people of those countries occupy a higher moral plane, but so far as industrial securities are concerned, shares are held to represent the value of the property for which they stand. This country is still a borrower and for many years to come will need to look elsewhere for funds with which to develop its resources. It is to be feared however, that if the speculative influences which for the past few years have grown so rapidly and become so destructive are much longer allowed to dominate investment securities, that lenders abroad will be much less likely than heretofore to supply the necessary funds. It is probably useless to expect that any radical change in method would be for a moment tolerated by the class who now control the markets of the world, but it will at least do no harm to drop a word of caution lest the speculative mania become so controlling as to altogether rule the financial affairs of the country.

THE JOINT TRAFFIC ASSOCIATION AND THE LAW.

Notwithstanding the supposedly adverse position taken by the Interstate Commerce Commission in regard to the legality of the Joint Traffic Association, that organization has undertaken to carry out the agreement as proposed and may now be said to be in working order. The immediate result is that at no time since the act to regulate commerce went into effect have the purposes of that law, so far as the discrimination in rates is concerned, been so completely accomplished as during the past ten days. It is safe to say that the published tariffs rates in the territory embraced within the organization are being absolutely maintained, a condition of things altogether new and strange. Another gratifying feature is that the situation is accepted by the shipping public with the utmost satisfaction, and that the relief afforded by reason of the certainty of obtaining the best possible rate without canvasing the entire list of transportation lines, is thoroughly appreciated.

The outcome of the proceedings instituted by the commission in connection with this agreement can scarcely be considered doubtful. It is not conceivable that the railroads in question, having an honest desire to conform to the law, and having also at their command the best legal talent in the country, should voluntarily occupy a position amenable to the law. It may answer the purpose of the sensational journalist or the more sensational politician to sneer at the profession of a desire on the part of the railroads to conform to the law but such is nevertheless the fact. Nor is it necessary to attribute to them any higher motive than self-interest. The enforcement of the agreement determines the line between prosperity and bankruptcy, nor does that mean that rates are to be advanced in any degree; it merely means that those who have heretofore profited through a violation of the law will now be placed upon the same plane as all other shippers.

No more does the attitude of the commission in respect to the agreement necessarily indicate that it is hostile thereto, or that it considers the agreement as opposed to the law. Indeed, if it were not so well established that the commission is unalterably opposed to "trading," it might be readily inferred that the case had been brought with the consent of the railroads for the express purpose of determining the interpretations of certain disputed propositions embraced therein. It is however possible that the commission considers the opportunity a favorable one for ascertaining just how the courts are going to construe the law. That the agreement savors in any sense of a pool or is in any way violative of the fifth section of the act to regulate commerce, is scarcely worth denying. The pooling principle is altogether lacking in the agreement. It is for that reason that this journal has from the first expressed its doubts as to the tenure of the association; not that it is believed the pooling principle should have been adopted in advance of its legalization, but that no agreement having for its object the exact maintenance of an equitable tariff can long exist in the absence of that element.

THE LIMITATIONS OF THE CAR FERRY.

The car ferry although of comparatively modern origin, is rapidly developing into an important factor among the transportation facilities of the country. The steamboat as the carrier of merchandise has been superseded by the railroads at least in all places where the mileage of the two routes approximate each other. The car ferry, however, which proposes to take on board the loaded car at one point and deliver it with contents unbroken at another point from which it may continue its journey, is in some quarters believed to possess sufficient advantages to overcome the hitherto regnant position of the railways. Whether the attempt will be successful is as yet problematical, but enough has been done to demonstrate that the service is practicable. It is true that an element of danger and uncertainty attaches to this method, and that cars instead of being safely delivered at destination are liable to find a permanent resting place beneath the water (as was the case during the past few days where the cars during a storm broke away from their fastenings and went overboard), but the percentage of loss from this cause may not greatly exceed that which attaches to railway transportation, and is therefore of on particular moment.

The real problem in the case is the point of distance at which this service ceases to be profitable as compared with rail transportation. As at present employed, the service covers in one instance a distance of over two hundred miles in direct competition to and with no material saving of distance over the competing rail lines. In this case the experiment has not been sufficiently long to demonstrate its profitableness, but the attempt is at least significant. The question is evidently one of "handling." In other words, if it shall be found cheaper, all things considered, to transport a given number of loaded cars over an intermediate portion of a through route than to break bulk and handle the property twice over the same route, the car ferry may possibly succeed. It must be remembered, however, that such a ferry cannot be loaded to its full transportation capacity, and that the waste of cargo room must be taken into account in determining the question.

There is another feature not generally understood which must also be considered in this connection. In the mere matter of movement expenses it is probably safe to say that it requires a greater amount of energy to propel a given weight through the water than it does to move an equal weight over a railroad at the same speed. That is to say, given a thousand tons loaded on a steamboat and the same weight put into cars, the actual expenditure of force necessary to move them both at the rate of ten miles per hour would be less for the cars than for the steamboat. This fact accounts in large measure for the displacement of water by rail transportion: probably, it is safe to say that added to the element of time it altogether accounts for this result. It is to be feared, therefore, that any considerable extension of the car ferry experiment is not likely to succeed, if indeed some of the present actual and projected lines will not of necessity be discontinued. For across-the-lake service, where distances are not too great, it may answer a valuable purpose, but as a factor to take the place of practicable rail transportation it will probably never be found serviceable.

HEATING SURFACES AND GRATE AREAS.

It has been well said that the question of the proper proportions of grate areas is a live one among railway men to-day. It is one of the matters about which every mechanical officer has his own opinion, but it is admitted by nearly all of these men that almost nothing is known as to the relative values of different arrangements of the heating surfaces which must be provided for taking up this heat generated by combustion and transmitting it to the best advantage to the water in the boiler. The problems connected with the boilers of locomotives are without question among the most important with which mechanical railway men have to do at the present time. It ranks very near in importance to the hauling of more cars per train and the improvements expected in the loading of trains. It is therefore most sincerely to be desired that the investigation of the best design for locomotive boilers should be pursued upon a logical and comprehensive plan from which some reliable information might be obtained to form a foundation for attacking the problem from a correct engineering standpoint. It is at present admitted that the best stationary and marine boiler practice has outstripped the best which has been attained concerning locomotives in this respect, and the vast interests which would be affected by better use of fuel upon our railways render it imperative that more satisfactory information applying to the boilers used under the conditions which obtain in this country should be had. The investigations which must be made will be expensive but the game is worth a very expensive candle.

The differences of opinion upon this subject have been specially exemplified in recent designs of locomotives in use upon two important western roads, and while the large and the small grate areas are each vigorously defended and while there are apparently excellent reasons for taking sides with either party, no one seems to have the hardihood to express an unqualified approval of the position of either. The fact is that we do not know enough about the merits of either case. It was pointed out in the excellent editorial statement of the grate area matter in the latest issue of *The Railway Master Mechanic*, (see our issue of last week) that it will not do to neglect the effect of the heating surface upon the hot gases from the grates, and that be the grates large or small, the heating surfaces must not be left out of consideration. It is perhaps equally necessary to secure an arrangement of these surfaces which will best enable them to absorb the heat both in the fire-box and in the tubes.

In this connection it is important to know what the relative values of the different arrangements of the fire-box heating surfaces are. In the comparison between the boilers of the Chicago, Burlington & Quincy Columbian engine, illustrated in our issue of December 17, and that of the Chicago & Northwestern, described in the issue of November 2, it is not sufficient to say that the former design has a total heating surface of fifteen hundred eighty square feet and the latter has three hundred twenty-four square feet more than this. Neither is it proper to compare the fire-box heating surfaces and say merely that while the Chicago, Burlington & Quincy engine has one hundred eighty-seven and four-tenths square feet, the Chicago & Northwestern engine has one hundred eighty-eight and one-tenth square feet, being practically the same in both. The arrangement of these surfaces probably has much more to do with their efficiency than is realized, and while not probable it is possible that the form of the fire-box of the Chicago, Burlington & Quincy engine whereby the sides are sloped inwardly may offset the advantage of the difference in the total heating surfaces.

This subject occupies the attention that it does at the present time owing to the paper on wide fire-boxes presented before the Western Railway Club by Mr. J. Snowdan Bell, and as the members of this club are perhaps the most interested, it would seem to be desirable that the club should take the matter up again, in the form of a specially prepared discussion with a view of afterward arranging a plan for a series of tests looking to the establishment of some reliable data. It is thought that with two locomotive testing plants conveniently at hand, that it should not be difficult to arrange this, and no more profitable work can be done by this club at this time. The tests should include the investigation of the degree of completeness of combustion at different rates of fuel burning and the relative values of the different heating surfaces should also be determined.

Correction Notice.

Our attention has been called to an error on page 7 of the issue of last week in the closing paragraph of the thirty-four-foot combination stock and coal car, built by the Madison Car Company for the Choctaw, Oklahoma & Gulf railway. The truck bolsters are of the standard pattern of these works, and not of the Schoen type as stated. The illustration of the truck shows the bolster used.

THE Q. & C. COMPANY.

The many friends of the Q. & C. Company (and their number is legion) will be rejoiced to learn that the receiver has been discharged and that the company has resecured control of its business. Although the conditions necessarily attaching to a receivership have made the conduct of the business somewhat difficult, the company has paid all of its obligations in full with six per cent interest added and "comes into its own" again with if possible added luster to the enviable reputation for fair dealing already possessed by it. That it was able to pull through with such credit during a time of unusual depression is sufficient of itself to place the company in the front rank.

The Holding Power of Lag Screws.

Some time ago I made a few experiments on the holding power of lag screws, the result of which is given below, hoping it may be useful for some of the readers of the American Machinist, says a writer to that journal. The holes were bored by a common carpenter's bit in 8 in. square logs, and the screws put in same as would be in common practice, and they were pulled out by the use of an Olsen testing machine:

Diameter of screw.	Diameter of bit.	Length of thread screwed into the wood.	Kind of wood.	The load at which screw pulled out.
⅞ in.	⅝ in.	3 in.	Spruce	5,900 lbs.
⅞ in.	11-16 in.	3 in.	"	5,900 lbs.
⅞ in.	¾ in.	3 in.	"	6,000 lbs.
⅞ in.	¾ in.	5 in.	"	9,000 lbs.
⅞ in.	¾ in.	5 in.	Chestnut	9,500 lbs.
¾ in	⅝ in.	4½ in.	Spruce	7,000 lbs.
¾ in.	⅝ in.	4½ in.	Pitch pine	8,300 lbs.
⅝ in.	½ in.	4 in.	Spruce	6,000 lbs.
½ in.	⅜ in.	3½ in.	"	3,500 lbs.
⅜ in.	5-16 in.	2 in.	"	1,900 lbs.
¼ in.	3-16 in.	1 in.	"	700 lbs.

The experiment seems to indicate that there is no advantage in using too small a bit when boring holes for lag screws. For instance, the ⅞ screw required full as much force to pull out from out from a ¾ hole as it would take to pull out of a ⅝ hole, although it is a great deal easier to put the screw in after a ¾ bit than it is after a ⅝ bit, and it is certainly work spent in the wrong direction to use a bit smaller than the core of the screw.

By splitting the block and examining the wood around the screws it will be found that when too small bits are used the fibers in the wood around the screws are crushed and destroyed, but when the right size bit is used the thread in the wood around the screw looks clean cut, the texture of the fibers is pressed and the fit in the wood on the screw resembles the appearance of a nut on a bolt.

When the ⅞ screw was screwed into a ¾ hole its full length of thread, or 5 in., it required a force of 9,000 lbs. to pull it out; therefore it is safe enough for any temporary job under a steady stress to lift one

ton in a $\frac{5}{8}$ lag screw, as this gives about 4 as factor of of safety in pulling out of the wood, and there is no danger of pulling off the screw itself, because at the place of the core where it could break it is about $\frac{11}{16}$ in. in diameter = 0.37 sq. in. area.

Assuming ultimate tensile strength to be 50,000 lbs. per square inch, the breaking load would be 50,000 × 0.37 = 18,500 lbs.; thus there is no danger at all of the screw itself breaking for a load of a ton.

P. LOBBEN.

Fitchburg, Mass.

THE OHIO LOCOMOTIVE INJECTOR.

The accompanying illustrations show the general appearance and also the details of construction of the Ohio locomotive injector, which was placed on the market a few years ago. From the success it is meeting it would appear that it is making an excellent reputation for itself. It is a lifting injector and made in two types, one having a screw and the other a lever attachment for starting. The body of the injector is made in two parts which are bolted together, and can easily be taken apart for cleaning. The greatest trouble with all classes of injectors comes from the liming up of the condensing tube and the delivery tube (marked 18 and 19 in Fig. 2). It will be noted that these tubes are screwed to the line check and so constructed that they can be removed with an ordinary monkey wrench without disturbing the other parts of the machine. It will also be noted that the intermediate tube 17, is held in place by the body of the injector when screwed together. The importance of this construction will be understood when it is noted that all these tubes can be removed for cleaning without disturbing the pipe connections This facilitates the cleaning also any necessary repairs. It is claimed that the wearing quality of these tubes is very good, and that metal specially prepared is used in their construction.

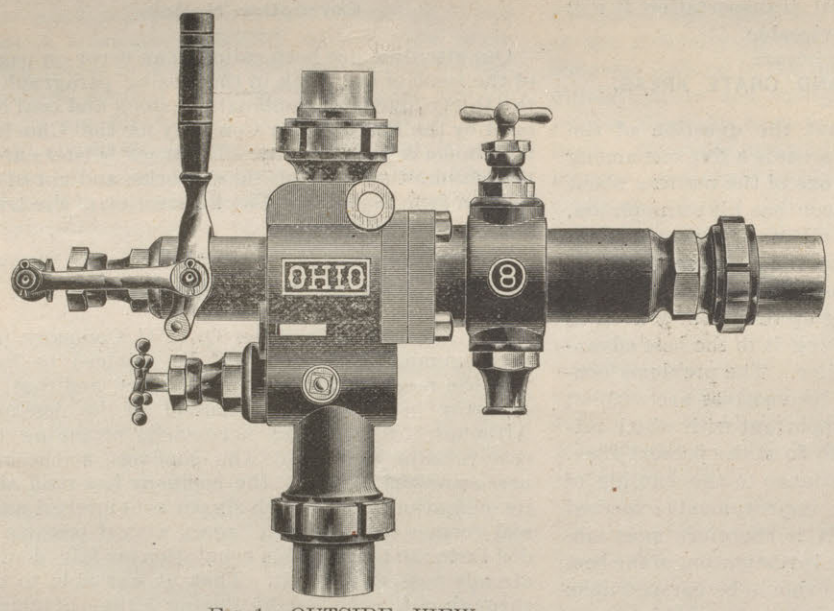

FIG. 1.—OUTSIDE VIEW.

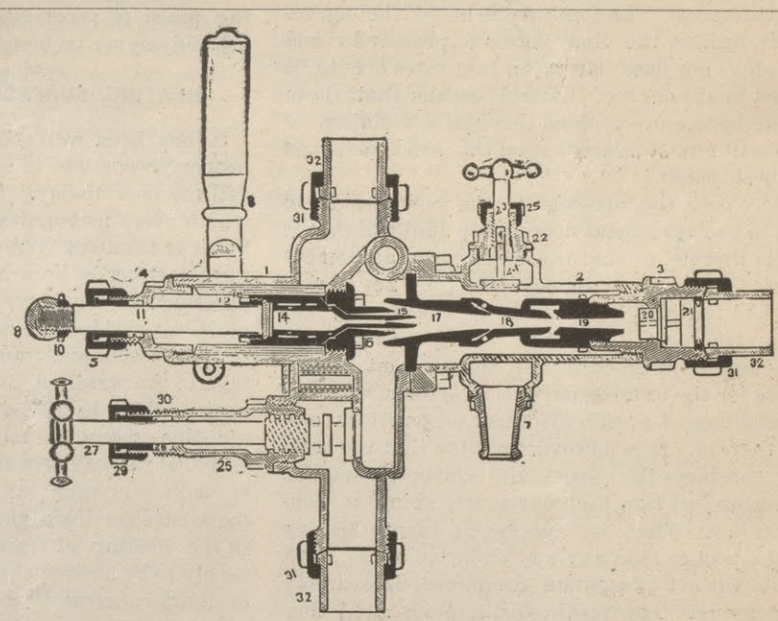

FIG. 2.—SECTION.

The starting of the injector is reduced to practically one movement, and is accomplished by the lever 8, which is drawn back until the resistance of the lifting tube is felt and allowed to remain in this position until water appears at the overflow 7, when the lever is drawn back as far as it will go. In stopping, the lever is merely pushed back to its normal position, and the quantity of water needed is regulated by the valve 27. For using the injector as a heater the overflow valve 24 is closed, and the lever drawn back until resistance from the lifting tube is felt, at which point it is then allowed to remain.

One of the most important points in any injector is that of reducing the quantity of live steam necessary for producing a given flow, and it is claimed for this injector that it will give the maximum capacity and greatest efficiency in this direction. It is further claimed that it is absolutely reliable in starting under all conditions; and while the greatest care has been given to this point in the design, the additional precaution is taken of thoroughly testing every machine before it is shipped. It is also claimed that the machine has a wide range of capacity, and can be graduated so as to supply the proper amount of water for running the locomotive light or for hauling its maximum load.

The machines are made in two styles, one being the Ohio standard and the other the Pennsylvania standard. The dimensions and construction are such as to enable it to interchange with the other principal injectors in use and can be substituted for any of them with no expense for attaching. The machinery and tools of the plant at Wadsworth, O., where the machines are being manufactured, are said to be of the latest and most perfect design, which goes a long way toward ensuring good workmanship. Mr. Frank W. Furry is general manager of the company, and has an office at 1302 Monadnock block, Chicago. Mr. Furry will be glad to give any desired information regarding the machine, and will also give testimonials from some of the largest roads in the country.

THE ANNUAL COST OF A FREIGHT CAR TO ITS OWNER.

Although the late ballot of the American Railway Association did not receive the 75 per cent of car ownership necessary to adopt the per diem plan in place of the mileage system next January, yet the fact that it commanded a majority shows very clearly that it is only a question of time; of a few years, or months even, before the present system will give way to the per diem plan of settling for car service. Ever since this reform was first broached, by the late William P. Shinn (as far as I am aware), it has possessed the vitality of a true and necessary thing. First making making its appearance among bodies of railroad men in the Car Accountant's Association in Richmond in 1884 in a resolution offered by the late Mr. E. G. Squire of the Chicago, Burlington & Quincy, at which time its advocates could almost be numbered on the fingers of one hand, it has moved forward, with but occasional backsets, until we now find one-half the roads and a majority of the car ownership anxious for its adoption. It seems to have escaped the quagmires of the mongrel system of a mixed per diem and mileage which at one time threatened it, and is likely to be established largely on the lines laid down by Mr. Shinn, of a straight per diem, saving only the rate in which he appears to have been entirely wrong. The rate to which opinion has constantly gravitated and which the present paper wiil seek to reinforce, having been first advanced by Mr. O. Chanute, chief engineer of the Erie Railway, in a communication to the American Society of Civil Engineers, in October, 1883, where he proposed a rate of 25 cents a day, in opposition to Mr. Shinn, who claimed it should be a very much higher figure.

There can be no doubt that the rate eventually adopted must closely approximate the cost of the car to its owner, which it is even more the interest of the car renter to pay than it is for the car owner to exact; for we can be very sure that no man or set of men will build cars for others to use at a loss to themselves, so that if for any reason they do not receive their full value as rental they will exact it in some other way; otherwise, car owning not being an eleemosynary institution they would not let the cars go beyond their own control. It is the aim of the present paper to enumerate more precisely than possibly has yet been done the various elements which enter into this cost, to show what portions of them should be taken into account in fixing the rental, and finally to fix within narrow limits the rate that should be attached to each item.

As some of the conclusions I shall draw will, I feel quite sure, contravene opinions ordinarily held, even by many well informed on this subject, I am obliged to ask the patience of my reader in traveling over well worn ground, as it is only by making sure of every step that I can hope to make myself clearly understood and secure a concurrence in the views I am about to express.

What do we mean, in the first place, by the cost of a car in this connection, from which we are to deduce the annual or daily rental. I mean by this all the additional expenses which a railroad company or individual will incur by reason of owning and running the car, over and above what it would have to pay out if the car was furnished and maintained without change by someone else.

Let us see of what items this expense consists and into which it naturally divides itself, according to the way that railroad accounts are kept. They may be enumerated under five heads:

1. Repairs (Wear and Tear).
2. Renewals (Depreciation).
3. Repairs of car shops and machinery, including the rental of same when actually paid, or the interest on the capital invested in them when owned.
4. Salaries and office expenses of employes engaged in keeping track of the cars and settling for their use.
5. Taxes.

These five items, I believe, will be found to embrace the total outlay of the owner. If the car is rented he must of course receive

6. Interest on the first cost or capital invested in the car.

And the amount of the rental (provided it is sufficient to cover the above expenses) will determine the rate of interest he receives.

I shall now try and fix the amounts which we should affix to each of these items. The first two items, repairs and renewals,are almost always kept together, no attempt being made to separate them, and they form the bulk of the account "Cars—Repairs of Freight" of the Interstate Commerce Commission classification. (14) Now, although this account has been kept for years by the various railroads and car owners, and the figures that have been published from time to time of their experience, together with the closer knowledge which comes from the study of equipments of roads with which we are brought more immediately in contact, enables us to fix the annual cost per car of these repairs within narrow limits, it should be borne in mind that minute accuracy in this respect is neither attainable nor desirable. The genally downward tendency of the cost of materials and the use of improved machinery tend, on the one hand to lower the original cost and the annual cost of maintenance, while on the other the introduction of improved appliances, such as air brakes and automatic couplers tends to increase the cost of both these items. Besides in an extensive country like ours, it by no means follows that a price which is exact for Pennsylvania is equally true for Georgia. I shall, therefore, content myself with giving a general, round figure like the percentage on the first cost of the car, which will be equally applicable for box and flat cars; figures which have been arrived at from as careful a consideration as I have been able to give the subject through a number of years and which I am satisfied no experience in the immediate future will materially change.

If we have the opportunity of comparing the repairs of an individual car equipment, such as a fast freight line, for instance, with the repairs of the cars of the railroad over which it runs, after making the proper correction in the latter for the repairs of its own cars on foreign roads, we shall probably be surprised at first at the apparent discrepancy between the two. Thus a box car equipment of an individual owner will cost for a series of years between $45 and $50 per car per year, while the cars of the railroad will run from $60 to $70, according to the proportion of lower priced cars than box cars which the equipment may contain. What is the cause of this difference?

On examining the list of items which are charged into the account we shall find that the difference arises, not from there being any real difference in the cost of repairs, but from the fact that a number of items (running repairs) are charged into the account "Cars—Repairs of Freight," which are always paid by the road running the car and are never charged to the foreign car owner. But as they appear in the railroad account they will be included in cost of repairs of the railroad cars unless we take pains to sift them out.

The matter is alluded to here, first, to emphasize the fact that we must always be careful to know in any account of car repairs whether the running repairs are or are not included; and second, to point out that these repairs can form no portion of the per diem charge, since they are always paid by the road using the car, as user, and never charged to the owner of a foreign car. Briefly, these running repairs consist of repairs to cars damaged in wrecks or derailment, the wages, tools and supplies of car inspectors, and such other items as may be agreed upon from time to time between roads and embodied in the M. C. B. rules. See further M. C. B. rules 7, 8 and 9 and the interstate classification accounts (14).

The amount of the running repairs are supposed to depend upon the mileage made by the car as the most convenient measure, and are said on competent authority to equal one-fourth cent per car per mile. While this may be true for a mixed equipment of box and gondola or coal cars, in the opinion of the writer one-fifth cent will pay the running repairs of box cars, but the matter is of no consequence here since they are especially excluded from consideration as forming no part of the per diem cost to the owner of the car.

So far then I shall assert as capable of abundant proof that the sum of the first two items which enter into this account, the wear and tear (so called by me to distinguish it from repairs, which contain running repairs and renewals), plus the depreciation equals nine per cent of the cost of a car yearly. That is to say, if a car cost $500, this will amount to $45.

Compare on this subject a very interesting paper printed by Mr. E. C. Spalding, October, 1886, where the average repairs of some 648 box cars are found to be $44.-70 per year. In this case I suspect the running repairs are included and the renewals left out, as is clearly the case in an article in February Guide, where the amount is given as $43. The depreciation being nearly equal to the running repairs causes the approximation of these figures to the one I have given.

It is often desirable to know the depreciation of the car separate from the repairs, and as it is a matter capable of calculation I here proceed to indicate how it is to be obtained. By depreciation I mean the certain sum of money which, if laid aside yearly, with simple interest added, will be sufficient to build a car of like value with the original when that is worn out. The rate per annum of the depreciation depends upon, first, the average life of cars; second, the value of the scrap from the old car; third, the rate of interest which can be got for the fund that is laid away.

Taking the average life of a car at thirteen years, the rate of interest at 5 per cent, and the value of scrap at 16 per cent of the cost of the car, equal to $80 for a $500 car, and we shall find that the yearly depreciation is equal to 5 per cent. This practically agrees with the M. C. B. rule of 6 per cent per year up to 10 years.

We then have fixed the first two and most difficult items of our account as follows:

For a car costing $500:

First, wear and tear per year, four per cent	$20.00
Second, depreciation per year, five per cent	25.00
	$45.00

While the depreciation is constant the wear and tear varies, being next to nothing for the first three or four years, then increasing up to the time when the car is generally repaired, when it falls off again.

For interesting matter on this subject see the paper of Mr. Spalding, before referred to.

The distinction between running repairs and wear and tear must here be borne in mind. Many items of running repairs are constant, being as much for a new car as an old one. Unless this is remembered the reader will hardly fully agree with me.

The third item, repairs of car shops and machinery, is often, I may say almost always, omitted from a consideration of the annual cost of the car, but it clearly should be included, since a private car builder or repairer would have to take it into account in estimating his expenses. I have practically no data on this point, further than that it has been customary in times past to add ten per cent to bills for work done for outside parties as compensation for use of tools, etc. This is probably somewhat more than the actual cost, and as it would amount to $4.50 per year on $45 I will make it $4 or eight mills on each dollar of the original cost of the car, which cannot be far out of the way.

The next item is too small to put any figures to, five or ten cents per year at most would cover it, and the only object in putting it down was to make the enumeration complete.

The last item, taxes, is also generally omitted from the account, although it is popularly thought that taxes are only one degree less certain than another event which it is to be presumed will happen not only to cars but to the individuals who write about them. It may not be improper here to call attention to the fact that while the public wants cars badly the same people encourage (?) the building of them by putting a tax on them as soon as built, which tax the railroad company, per force, puts again upon the shipper in the shape of higher rates for transportation; and so the mill goes merrily round. The amount of the tax on equipment appears to be about eight mills on the dollar.

We are now prepared to gather our results together, and the amounts which the percentages give for both box cars and gondolas are given below:

	Box cars Costing $500.	Gondolas. $450.
1. Wear and tear per year, 4 per cent	$20.00	$18.00
2 Depreciation, 5 per cent	25.00	22.50
	$45.00	$40.50
3. Repairs of shops, etc., 8 mills	4.00	3.60
5. Taxes, 8 mills	4.00	3.60
	$53.00	$47.70
6. Interest on cost, 6 per cent	30.00	27.00
	$83.00	$74.70

If the car is 20 days in shops each year, on an average, and I am led to think that is about right, there is 345 days service in it which at 25 cents per day gives $86.25.

It only remains to add in conclusion that in the above the writer merely speaks his own mind and is solely responsible for the facts and opinions advanced above.—[Edmund Yardley in the Railway Equipment Guide.

Amendments to the Act to Regulate Commerce.

The favor with which the various amendments to the act to regulate commerce suggested by the Interstate Commerce Commission have been received by the more thoughtful of the business men of the country, is well illustrated by the subjoined letter from a prominent lumber shipper of Chicago. Mr. Chas. W. Wells writing from Pasadena, Cal., says:

One of the most important questions that will come before congress during this session will be the relation of the government and the railroads. It has been eight years since congress first undertook to regulate the operations of interstate roads, and the study of these years has done little more than show the difficulty of the work then undertaken. Tho act of congress to regulate commerce between the states, commonly known as the interstate commerce law, was the response to a popular and very general demand that the government take some action to prevent abuses that had grown up in connection with the rate making power, whereby certain localities, or certain individuals of the same locality, were given undue advantage in freight charges. The right of congress to regulate commerce between the states is clearly given by the constitution. The necessity of such a law, not only to protect the people from unreasonable rates, or unjust discrimination, but also for the conservation of the railroads themselves, is becoming more and more apparent every day. In fact, the operation of the present law tends to show that minimum rates are as necessary to protect the security holders as maximum rates are to protect the shippers. The average charge per mile for the transportation of passengers or freight is extremely low, and yet it is a curious fact that, while the charge for transportation in this country is but one-third to one-half the charge for a like service in Europe, the rates of freight in some sections are so high as to be almost prohibitive, and this, too, in the thickly settled sections of the country. It is this inequality of rates that seems to be the greatest present evil, and one which as yet, the railroads themselves have been unable to handle satisfactorily, so that it would appear to be absolutely necessary to have some controlling power outside and independent of the roads themselves.

The intention of the interstate commerce law was good. That its results has been largely a failure is due partly to the vastness and complexity of the subject in hand and the inexperience of the framers of the law, but more because, instead of enacting a general law, creating a commission on just and staple principles, and placing the whole subject under their control, they undertook to make certain specific acts of railway operation unlawful. It followed, as the logical sequence, that all acts not specifically declared to be unlawful were permitted. They created a commission to carry out the provisions of their act, but did not give it authority to enforce its decrees. The commission was formed on lines that are not in strict accord with the spirit of equity. The result has been constant friction between the commission and the railways, suspicion on both sides and but little real progress. Owing to the public character of railways, in dealing with this problem three parties must be considered—the government, which is the people acting as a whole; the public, the people in their individual capacities, and the railroads themselves. While the railroad and the shipper are most immediately concerned in each separate transaction, the fundamental and controlling power must always be the government; and this applies not only to the making of rates but to the protection to the property as well. To obtain the best results, the right of all interests must be fully protected—of the railroads as well as the shippers. To be just requires a full knowledge of the subject in hand, as well as the honesty of purpose; so it would seem that the railway commission should be composed of representatives of the shipping interests, the railways and the government. If a commission of nine members were to be appointed by the president—three on the nomination of the shipping interests, who would know the demands of trade; three on the nomination of the railways, who would know of the ability of the roads to meet these demands, and three on the nomination of the supreme court, who would know if the agreements that the representatives of the shippers and railways might reach conformed to the law of the the land—it is highly probable that better results would be obtained than under the present arrangements. The commissioners should hold office during good behavior.

Under such conditions it would seem proper to leave all details as to rates and method of operation, including the "long and short haul" clause and the "anti-pooling" clause to the discretion of the commission. The commission should have final authority in all rates, both passenger and freight. In this respect its decisions should have the force of a federal court. No charter should be granted for the construction of any new road without the approval of the commission. This country is to-day burdened by unnecessary roads that do not now pay and may never pay that were built simply to enrich some construction company. In this connection it might be well to make it criminal offence for any officer or director of any road to be interested in any way in any contract made by that company. Although the present commission has not found it possible to accomplish what was expected, it has rendered very valuable service in the statistics it has so carefully collected. These statistics deserve careful study. They will soften many harsh judgments quite generally entertained against the railroads, and go far toward more equitable and permanent settlement of the railway problem. These figures show that, notwithstanding the many faults the railroads have been guilty of, this country has the best railwry service in the world; that the charge for both passenger and freight transportation is the lowest in the world; that the wages paid are the highest in the world; that the interest paid on the capital invested is less than that paid by European roads, being slightly less than 3 per cent. This is not a large return, and any rash or ill-advised legislation might materially reduce even this low figure. Legislation, to be just, must protect those who own the railroads as well as those who use them.

NOTICES OF PUBLICATIONS.

PROBLEMS IN THE USE AND ADJUSTMENT OF ENGINEERING INSTRUMENTS. Form for Field notes; General instructions for extended Student's Surveys. By Walter Loring Webb, C. E., Assistant Professor of Civil Engineering in the University of Pennsylvania. Sixty-four pages, bound in morocco, with leather flap in pocket book from. Published by John Wiley & Son. Price, $1.00.

The author says that this book is the outgrowth of difficulties experienced by him in teaching the first elements of instrumental practice to engineering students. It was prepared in order to enable all the students of a party out for instructions in the field to obtain the best advantage from the work of the instructor. The problems are designed to keep each student busy at some definite work for for which he has instructions and explanations, so that he may employ his time to obtain a thorough understanding of the common instruments used in engineering work by the time he is ready for more advanced work. The students attention is specially directed to the precision which it is necessary to secure while doing the work in order to obtain the final results with the required degree of accuracy.

The book is not intended to take the place of a text book on surveying, but it is rather a supplemental work to be used to enable many students to get the most possible assistance from one instructor. Some local allusions occur in the book, as it was prepared primarily for the use of students of the University of Pennsylvania, but these also have general applications. The problems given, if properly worked out, will add greatly to the store of practical knowledge of the students, and the selection of work has been made with this practical value in view. Special attention is given to methods of taking notes. The principal subjects treated are as follows: Linear measurements, chain urveying, compass and level practice, transit and plane table practice, work with the sextant, barometer, polarplanimeter and pantograph railroad surveying with curve work, cross-sectioning and setting slope stakes, probable error, and finally notes on the management of a students' railroad survey. This includes the reconnoissance, preliminary survey and location survey, with the best methods of keeping notes. Diagrams are shown in connection with the notes.

The little book is well planned and arranged, is concise and clear in statement, and seems to fulfil the object of the author in an admirable way. Its strong point is in the problems involving the common engineering instruments, and the book seems to be well adapted for the use of others as well as students.

ENGINEERING CONTRACTS AND SPECIFICATIONS. Including a Brief Synopsis of the Law of Contracts and Illustrative Examples of the General and Technical Clauses of Various Kinds of Engineering Specifications. Designed for the Use of Students, Engineers and Contractors. By J. B. Johnson, C. E., Professor of Civil Engineering, Washington University, St. Louis, Mo. Engineering News Publishing Co., New York, 1895. Price, $4.

One branch of the preparation for engineering practice which has been seriously neglected by technical schools is that which deals with the preparation and use of contracts and engineering specifications. This was on account of the lack of satisfactory books upon the subject. It has been necessary for most engineers to undergo a considerable amount of experience in obtaining information which it is necessary for them to have with regard to this subject, and this work by Prof. Johnson is greatly needed by students. It is likely to be not less valuable to contractors and engineers. The author states that while he makes no pretensions to a knowledge of the law it was necessary for him to impart instruction upon this subject for many years to his students, and by attending lectures in this field in the St. Louis Law school, as well as through consultation of works by writers upon the law of contracts he has prepared this work as a synopsis and general guide to the fundamental principles involved. The brief synopsis given is not intended to take the place of consultations with lawyers, but only to enable one to steer clear of some of the legal pitfalls which lie in the way of every business man, and especially of engineers. In addition to the treatment of the law of contracts the author has compiled a large number of the latest specifications used by the most prominent engineers of this country which are selected as good patterns of methods for treating the subject. This particular part of the work will be of the greatest value to young men who are called upon to interpret specifications inasmuch as they will enable the reasons why they are drawn in a particular way to be clearly understood. The work is divided into four parts, the first of which gives a synopsis of the law of contracts; the second treats of engineering specifications and accompany documents. The third takes up specific descriptive or technical clauses in specifications, and the fourth presents illustrated examples of complete contracts and specifications. The work covers a great variety of subjects without slighting any of them, and the arrangement of the book is such as so enable a student to get what he wants without unnecessary searching. The author gives introductions to all of the quotations from engineering practice which are brief and to the point. The book is one which every engineer should have conveniently at hand for consultation.

"A THIRD OF A CENTURY OF PROGRESS;" Being a Brief History of the Development of the B. F. Sturtevant Co. 1896. Catalog No. 90.

This is a pamphlet of thirty-six pages, issued by the Sturtevant Co. and inscribed: "Something attempted, something done," and it describes how Mr. B. F. Sturtevant, a young shoemaker of Norridgewock, Maine, started in 1857 what was destined to become the large and successful establishment which is now conducted under his name. Mr. Sturtevant's start was due to the successful design of a machine for pegging shoes. The pegs being put into the machine in the form of a continuous ribbon from which the individual pegs were clipped off. The peg wood as well as the machine itself, met with such an unqualified success that their introduction led to the adoption of a power exhaust fan for the removal of the dust which was produced by the working of the machine. This apparatus was used also in connection with buffing wheels, and from this the development of a number of additional uses for the blower was rapid, and the manufacture of the exhaust fans was taken up at 72 Sudbury street in Boston. The pamphlet details the steps made in the advancement of the blower industry, and the application of these machines to the various branches of manufacturing with which it has been intimately connected ever since. The Sturtevant pressure blower was brought out under this name at the Centennial Exhibition in Philadelphia, 1876, and it is stated in this catalog that "thousands of blowers of this type are running to-day upon which not one cent's worth of repairs has been necessary during all these years, notwithstanding the high speed and continuous service under which they have been operated."

From this point the introduction of direct steam driven blowers is taken up in connection with the introduction of mechanical methods for the ventilation of buildings. In connection with these, coil heaters were employed, and the growth of the works necessary to enable the demand for this special machinery and apparatus to be met are outlined in detail. The company was obliged to take up the design in construction of high speed steam engines, which has become an important line of development. The account of the work states that upon the death of Mr. Sturtevant in April, 1890, the management continued under the direction of Mr. E. N. Foss, who had for some years been in general control as treasurer and general manager. Since this time the growth in the business has been steady and marked, and new fields have been opened up for usefulness for the blower. An interesting description is given of extensive alterations in the works, which were necessitated by the raising of the adjacent tracks of the N. Y. N. H. & H. R. R., and descriptions are given of the improvements in the plant which were made at this time. The pamphlet closes with a list of the officers of the company in Boston, Chicago, New York, London, Philadeiphia, Glasgow, Berlin and Stockholm. The frontespiece is a photograph of Mr. Sturtevant. The pamphlet is further illustrated with excellent wood cuts of the apparatus and of the works at different periods of their history. The letter press is excellent and the attractiveness and tastefulness of the work is characteristic of the literature issued by this company.

The Ashton Valve Co., of Boston, has issued a handsome calendar representing "a placid summer scene in New England," which it will send to its railroad friends. The view is a sleeping pool in the foreground with a small hamlet in the distance. A man in a boat fishing among the lily pads is a seductive feature.

PATENTS ON RAILWAY APPLIANCES.

[The following list of patents granted for inventions relative to railroad appliances for the week ending December 31, is reported especially for the Railway Review, by Chas. L. Sturtevant, patent attorney, Washington, D. C., from whom printed copies can be obtained for 15 cents each.]

Bedard, Firmin, assignor to C. Bedard, Minneapolis, Minn., logging-car, 552,346.

Bratton, Jacob C., and A. B. Graham, St. Louis, Mo., burglar alarm attachment for railway cars, 552,465.

Cook, Miles P., assignor to Cook Cooler Company, Limited, Flint, Mich., cooling device for car-journals, 552,350.

Cook, Miles P., Flint, assignor to Cook Cooler Company, Limited, Genesee, Mich., axle-cooler, 552,235.

Curtis, Frank J., Ben Avon, assignor to McConway & Torley Company, Pittsburgh, Pa., car-coupling, 552,352.

Cutten, Elisha B., New York, assignor to A. C. and G. H. Fraser, Brooklyn, N. Y., electric signal for railways, 552,279.

Dixon, Thomas B., Henderson, Ky., electric railway signaling system, 552,316.

Foote, Lewis A., Chicago, Ill., car seal, 552,175.

Foote, Lewis A., assignor to Chicago Car-seal and Manufacturing Company, Chicago, Ill., hand-press for seals, 552,174.

Gerlach, Frank W., Kenton, Ohio, car-coupling, 552,118.

Goltra, Edward F., St. Louis, Mo., assignor to American Steel Bolster Company, Madison county, Ill., car-truck, 552,493.

Griffith, Thomas A., Kansas City, Mo., car-coupling, 552,245.

Hovey, Henry J., Evanston, Ill., electrical railway signaling apparatus, 552,181.

Keefer, Calvin M., assignor of one-half to W. Devlin, New Castle, Pa., rail joint and clamp, 552,291.

Kelly, Alonzo, assignor of one-half to F. W. Long, Harrisburg, Pa., car-coupling, 552,478.

Kendall, Minott K., Melrose, assignor of two-thirds to G. Hodges, Medford, and E. Harrington, Boston, Mass., electrical rail-bond, 552,479.

Noble, Newell J., assignor of one-half to A. J. Shomber, E. H. Schilling, and T. Engle, State Center, Iowa, ventilation mechanism for locomotive or other boiler furnaces, 552,196.

Rhoads, John, Philadelphia, Pa., railway-car buffer-plate, 552,448.

Shumway, Willis M., Oak Park, Ill., car-axle box, 552,205.

Stark, William H., Toledo, Ohio, continuous car platform and buffer, 552,452.

Taylor, William J., Bound Brook, N. J., car-wheel, 551,255

WEEK ENDING JANUARY 7.

Bixby, John L., Jr., Arlington Heights, Mass., combined day and sleeping car, 552,629; sleeping car and vestibule, 552,682.

Bower, Louis A., Wilmington, Del., railway tie plate, 552,875.

Coder, Harry G., and F. C. Ruffhead, Williamsport, Pa., assignor to Keystone Car Door & Supply Co., Williamsport, Pa., and Chicago, Ill., car door, 552,821.

Davis, Wm. C., Denver, Col., ore car, 552,750.

Evans, Clarence A., Upland, Pa., car fan, 552,669.

Fine, Wm. R., Newport, Tenn., car coupling, 552,693.

Gaines, Chas. A., assignor of one-fourth to G. H. Gillette, New York City, conduit system for electric railways, 552,755.

Hartman, John, Philadelphia, Pa., storm front and look-out window for cars, 552,662.

Hatfield, Wm. H., Sulphur Springs, Ala., assignor of one-half to W. G. Morrison, New England City, Ga., car coupling, 552,836

Heintzelman, Taylor W., Sacramento, Cal., locomotive bell ringer, 552,760.

Hueffelman, Henry W., Dayton, O., car coupling, 552,642.

Lenox, De Boss, Trenton, N. J., inclined railway water chute, 552,713.

Lukens, Gabriel L., Decatur, assignor of one-half to C. Roney, Bethany, Ill., device for insuring collection of fares on railways, 552,878.

Markley, John A., assignor of three-fifths to J. C. Carpenter, J. A. Roberts, J. L. Duncan and J. C. King, Clifton Forge, Va., pedestal for car trucks, 552,768.

Marlett, Harvey L., Alpena, S. D., car mover, 552,537.

Pierce, Reginald H., Abu Road, India, rail joint, 552,775.

Shepherd, Frank D., Aurora, Ill., fire-box for locomotives, 552,671.

Stevenson, John F., Lamoille, Ill., car, 552,701.

Thomas, Eddy T., New York, and A. Melhado, Montclair, N. J., dumping car, 552,595.

Tresenreuter, Gustav, assignor to M. Treitel, Berlin, Germany, station indicator, 552,797.

Valliant, Joseph W., Baltimore, Md., brake for railway cars, 552,599.

Webber, Scott, Pigeon Cove, Mass., platform dumping car, 552,799.

TECHNICAL MEETINGS.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street, New York City.

The American Society of Irrigation Engineers. Third annual meeting will be held at Albuquerque, N. M., September 16-19. John L. Titcomb, secretary, 36 Jacobson block, Denver, Col.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Association of Engineers of Virginia, holds its informal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month; at the Manufacturers' Club, Philadelphia, Pa.

The International Irrigation Congress will hold its fourth session at Albuquerque, N. M., September 16-19. Fred L. Alles, secretary, Los Angeles, Cal.; local secretary, W. C. Hadley, E. M., Albuquerque, N. M.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Wednesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Tuesday in each month, at 8 p. m., at 12 West Thirty-first street, New York City.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

The Southwestern Society of Mining Engineers will hold a session at Albuquerque, N. M., September 16-19. Walter C. Hadley, secretary, Albuquerque, N. M.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Technical Society of the Pacific Coast has a monthly meeting on the first Friday in each month, at 8 p. m., at the Academy of Sciences building, 819 Market street, San Francisco, Cal.

The Western Foundrymen's Association holds its meeting on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, S. T. Johnston, 1522 Monadnock building.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Western Society of Engineers meets on the first Wednesday of each month at 8 p. m., at the society's rooms, 1736-1739 Monadnock building, Chicago, Ill. C. J. Roney, secretary.

The Central Railway Club meets on the fourth Wednesday of January, March, April, September and October, at 10 a. m., at the Hotel Iroquois, Buffalo, N. Y.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Denver Society of Civil Engineers meets on the second and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Engineers' and Architects' Club of Louisville has a monthly meeting on the second Thursday in each month, at 8 p. m., at the Norton building, Fourth avenue and Jefferson street, Louisville, Ky.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumberland Publishing House, Nashville, Tenn.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at the Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Engineers' Club of St. Louis meets on the first and third Wednesdays of each month, at the Missouri Historical Society building, Sixteenth street and Lucas place, St. Louis, Mo.

The Engineers' Society of Western Pennsylvania holds its monthly meeting on the third Tuesday of each month at 7:30 p. m., at the Carnegie Library building, Allegheny, Pa.

PERSONAL.

Mr. E. A. Dawson of Waverly has been appointed state railroad commission of Iowa.

Mr. W. W. Atwood has been appointed assistant train master of the Pennsylvania & New York division of the Lehigh Valley.

Mr. G. M. Woodward has been appointed commercial agent of the Wheeling & Lake Erie Railway, with headquarters at Chicago, Ill.

Mr. John Scott has been made controller of the western division of the Northern Pacific, thereby becoming controller of the entire system.

Mr. H. C. Landon has been appointed chief engineer of the Chicago, Peoria & St. Louis. The office of civil engineer on this road is abolished.

Mr. A. H. McLeod, heretofore general freight agent of the Cincinnati, Hamilton & Dayton, has had his title changed to freight traffic manager.

Mr. H. H. Hiland has resigned as chief clerk of the freight department of the St. Paul & Duluth, to accept the Minnesota agency of the Adams-Bagnall Electric Company.

Messrs. R. B. Lyle and J. E. Foresee have been appointed St. Louis agents of the Illinois Steel Co., with offices at 519 Security building, vice D. E. Garrison & Co., resigned.

Mr. T. W. House and M. T. Jones of Houston, Texas, were on Jan 7 appointed receivers of the Galveston, La Porte & Houston road by United States District Judge, David E. Bryant.

Mr. A. M. Ozburn, chief rate clerk in the general office of the Missouri Pacific, has resigned in order to accept an important position with a manufacturing company in Birmingham, Ala.

General Manager Winter, of the Chicago, St. Paul, Minneapolis & Omaha, has issued a circular announcing the appointment of Mr. W. C. Winter as assistant general general claim agent.

Mr. A. S. Willoughby has been made division freight and passenger agent of the Southern Minnesota division of the Milwaukee road, vice H. E. Pierpont, who has become assistant general freight agent.

On January 5 the office of Mr. Garret Brodhead trainmaster of the Easton & Amboy road was transferred from Perth Amboy to South Plainfield. All communications to him will now be addressed to the latter place.

Mr. William Heyman has been appointed agent of the Lackawanna Fast Freight Line at St. Louis, vice Mr. J. J. Collister, resigned, to accept another position. Mr. Heyman was formerly a contracting agent for the Erie Despatch.

Mr. S. D. Parkhurst, chief clerk to Mr. S. O. Brooks, assistant general freight agent, Chicago Great Western at St. Paul, has accepted the position of chief clerk in general freight department of the St. Paul & Duluth Railway, vice Mr. H. H. Hiland.

Mr. Andrew F. Burleigh has been made sole receiver for the Northern Pacific Railroad by Judge Gilbert, of the United States court at Portland. Judge Gilbert said a change was necessary, not for any personal reason concerning present receivers, but for more harmonious management of the road.

Mr. H. Delany, formerly superintendent of motive power of the Louisville, New Albany & Chicago road, is now master mechanic in charge of the Philadelphia & New York division of the Philadelphia & Reading Railroad. Office at Third and Berks streets, Philadelphia, Pa. Appointment went into effect January 1, 1896.

Mr. Henry Conlin, who has been for a number of years connected with the legal department of the Omaha as assistant attorney, has resigned to associate himself with a prominent law firm of Minneapolis. The name of the new firm will be Welch, Hayne & Conlin. It is understood his successor has been chosen, but his name is not yet known.

Mr. William Duncan, traffic manager of the Baltimore & Ohio Southwestern, has resigned that position, to take effect on February 1. Mr. Duncan has been in active railway service for nearly thirty years, and will retire from railway work but will become president of the Ludlow & Saylor Wire Co., of St. Louis, Mo., a concern in which he is largely interested.

Mr. J. J. Collister, who has been connected with the Lackawanna fast freight line, has been appointed commercial agent for the Clover Leaf at Kansas City and has established an office there. Two years ago the office was abolished on account of the panic and now the company, on account on the revival of its business, has found it necessary to re-establish its office there.

Mr. T. E. Brooks, of Louisville, formerly chief clerk in the office of the superintendent of transportation at Louisville, has been appointed master of trains of the Clarksville & Princeton and Clarksville Mineral branches of the Louisville & Nashville, with headquarters at Clarksville, Tenn. This to fill the vacancy caused by the appointment of Mr. Seeley Dunn, superintendent of the Owensboro & Nashville road.

Mr. Stephen C. Mason, assistant statistician of the Interstate Commerce Commission, has resigned to accept a responsible position with the McConway & Torley Co., of Pittsburgh, Pa. Mr. Mason has been connected with the commission over eight years, and for the last three years in direct charge of the statistical division and of the compilation of the statistical reports published by the commission.

The appointment of Mr. A. H. Thorpe as assistant to the general manager and purchasing agent of the Ohio River Railroad has been announced. Mr. Thorp was formerly connected with the Wheeling, and while located in Toledo took quite a prominent part in politics. He went to the Ohio River road with Vice President and General Manager Geo. A. Burt. It is said that under the administration of Mr. Burt and his assistant, Mr. Thorp, the road has enjoyed the most prosperous period in its history.

Mr. David G. Sutfin, local freight agent for the Lake Shore & Michigan Southern, died at his home on Drexel avenue, Jan. 3, of typhoid fever. Mr. Sutfin came from Buffalo to Chicago in May, 1892, as superintendent of the western division of the Lake Shore and served in that position until February, 1893, when he was made freight agent. Mr. Sutfin's immediate family consists of a wife and two boys, while numberless friends join in expressing regret for the loss of so able a railroad man and pleasant acquaintance as Mr. Sutfin.

The resignation of Mr. George Olds as general traffic manager of the Canadian Pacific has made other changes on the staff of officials. The position of general traffic manager has been abolished, and Mr. G. M. Bosworth has been appointed freight traffic manager with charge of freight traffic on all the company's lines. Mr. D. McNichol has been appointed passenger traffic manager on all the company's lines. They will have their offices in Montreal. Mr. Robert Kerr has been appointed traffic manager of the company's lines west of Fort William, with an office at Winnipeg.

Mr. J. J. Kirby heretofore travelling passenger agent of the Ann Arbor road has been given the title of general passenger agent. Mr. Kirby begin his career as messenger boy under Frank James, who was then division freight agent of the Pennsylvania. Eight or ten years of faithful work advanced him to a chief clerkship, which he resigned to accept a position on the Ann Arbor. Later he was appointed local freight agent for the Ann Arbor, from which he was transferred to the passenger department and promoted to traveling passenger agent. This change is in line with the policy to promote deserving officials and employes instead of importing men from other lines and as the growing passenger business of the Ann Arbor, is considered to be in no small degree due to the efforts of Mr. Kirby, the promotion will be deserved. His new position gives him more authority and a handsome increase in salary.

The following changes are announced on the Baltimore & Ohio R., it having been decided to divide the territory heretofore assigned to the general eastern passenger agent into two districts. Mr. A. J. Simmons, general New England passenger agent, with office at 211 Washington street, Boston, Mass., will have charge of the passenger business of this company in New England, the Maritime provinces, and the dominion of Canada east of and including the line of the Canadian Pacific Railway between Prescott and Ottawa. Mr. Lyman McCarty, general eastern passenger